November, 1948

THE FOUNDRY

wherever metals are cast...

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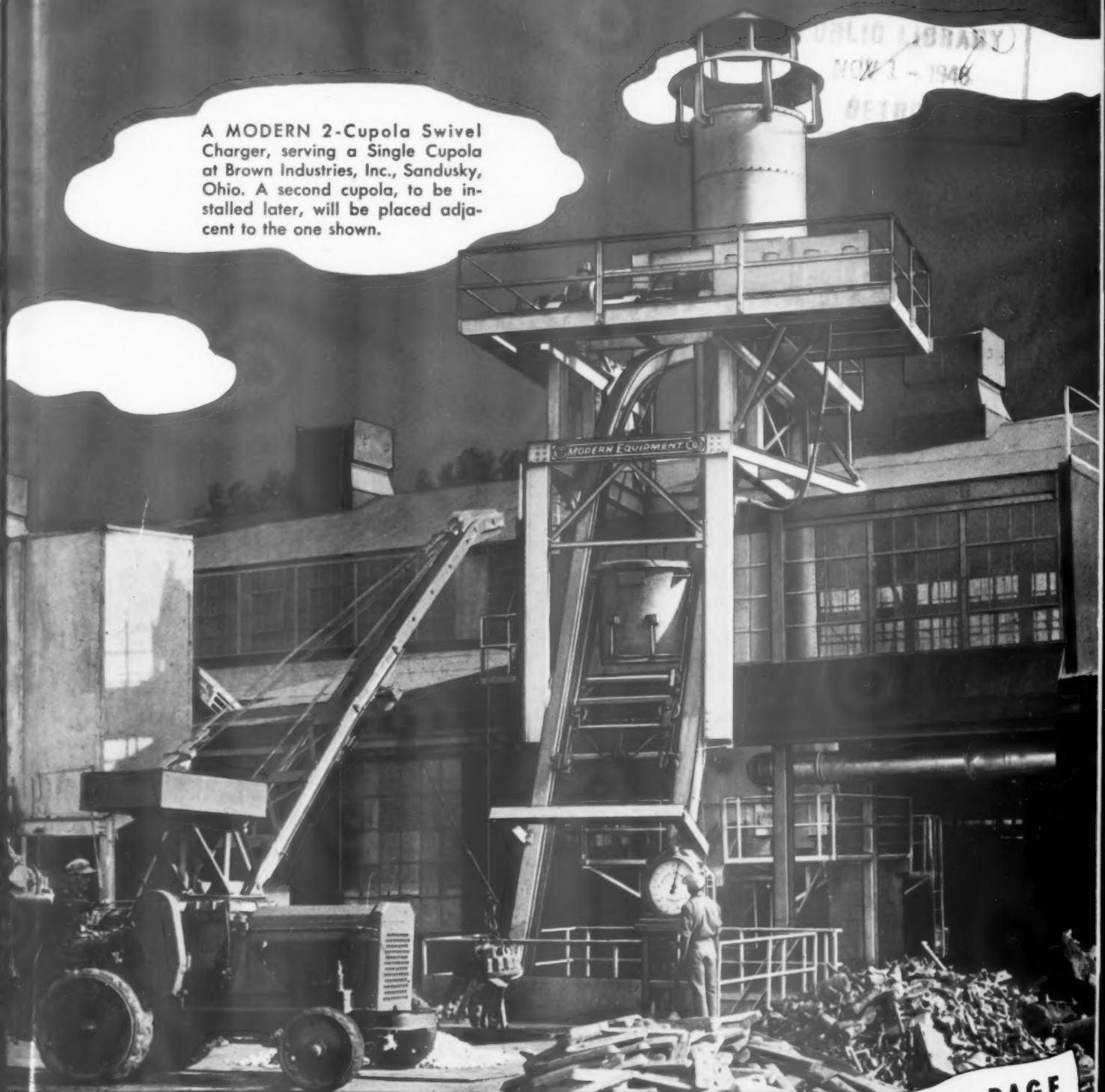
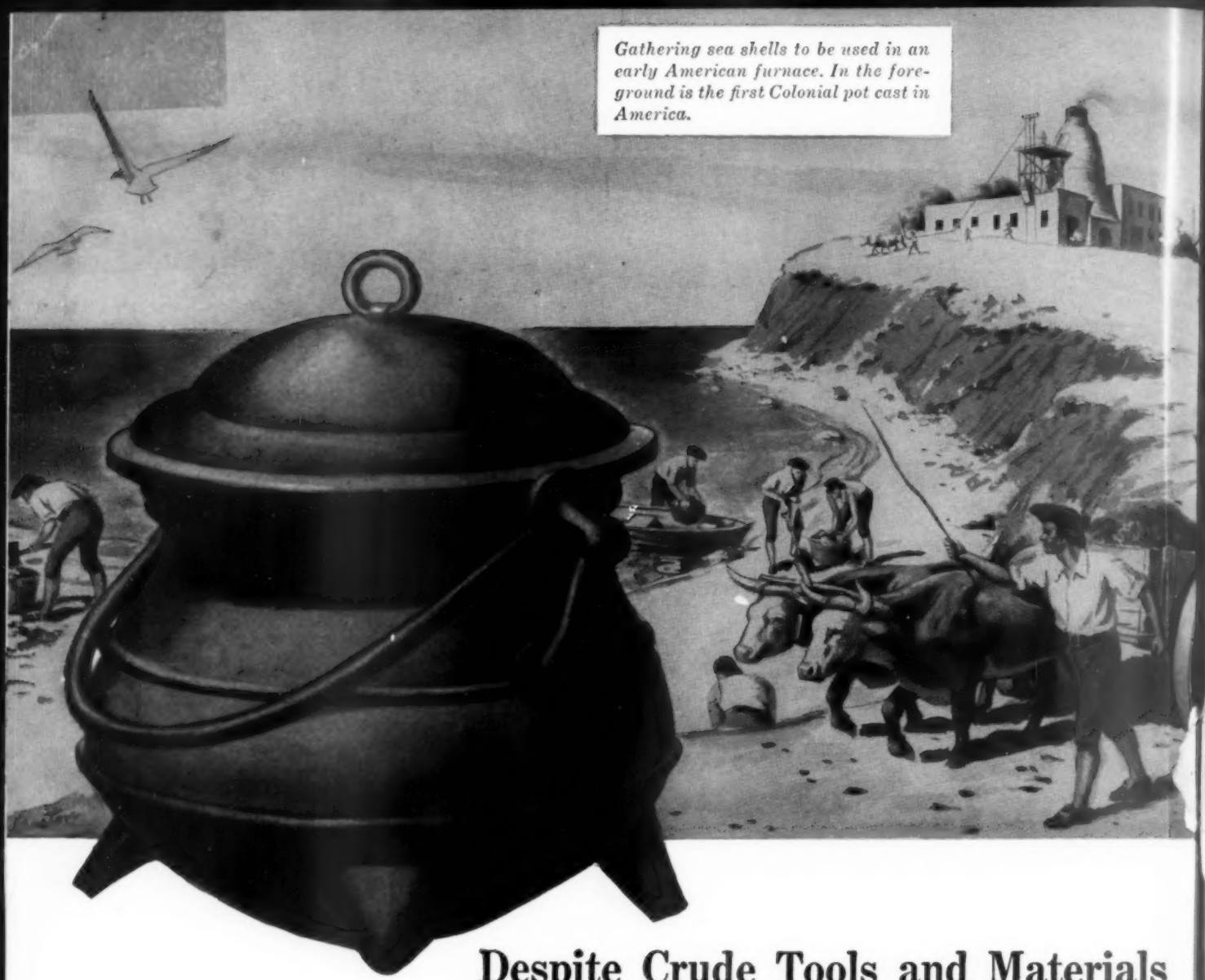
DETR

A MODERN 2-Cupola Swivel Charger, serving a Single Cupola at Brown Industries, Inc., Sandusky, Ohio. A second cupola, to be installed later, will be placed adjacent to the one shown.



MODERN EQUIPMENT CO.
FORT WASHINGTON, WISCONSIN

TURN TO PAGE FACING INSIDE BACK COVER!



Gathering sea shells to be used in an early American furnace. In the foreground is the first Colonial pot cast in America.

Despite Crude Tools and Materials

There Was Craft in Their Castings!

PURITE is commercially pure soda ash containing over 98% sodium carbonate, fused and cast into convenient 2-lb. pigs. Its desulfurizing and refining action are traceable to the chemistry of soda ash.

Eighteenth century producers of American cast iron were handicapped by the tools and materials then available. Bog iron from the floors of ponds, lime in the form of sea shells, crude furnaces, and cruder mechanical appliances—these were the limitations. But in spite of such difficulties, the early American iron founders produced castings that showed resourcefulness and craft.

Consider the advance in foundry practice since these early days. Of course, foundries now have better materials and improved equipment – the forehearth, for instance, in which the molten iron is refined after coming from the cupola.

Modern foundries also have PURITE—an alkali prepared in two-pound pigs. PURITE reduces sulfur, deoxidizes the iron, and washes out occluded gases and entrained slag particles. The result is a clean, fluid iron with improved casting properties.

Let us send you our latest pamphlet giving details on the advantages of using PURITE. Mathieson Chemical Corporation, 60 East 42nd Street, New York 17, N. Y.

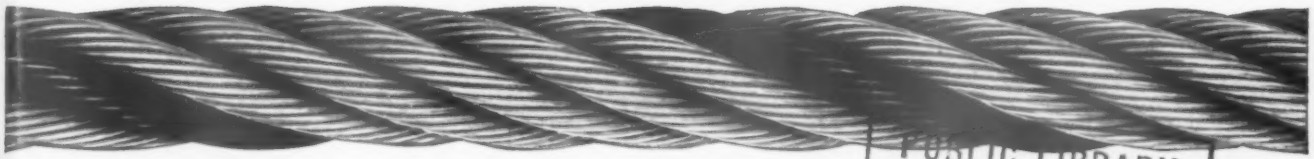
Mathieson

PURITE

Purite (Fused Soda Ash) . . . Liquid Chlorine
Caustic Soda . . . Soda Ash . . . Bicarbonate of Soda . . . Ammonia, Anhydrous & Aqua
Sodium Chlorite Products . . . Chlorine Dioxide
HTH Products . . . Dry Ice . . . Carbonic Gas
Sodium Methylate

TECHNOLOGY DEPARTMENT

TOUGH - *that's Purple Strand**



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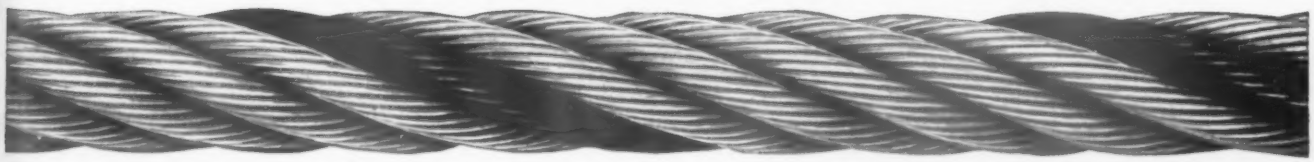
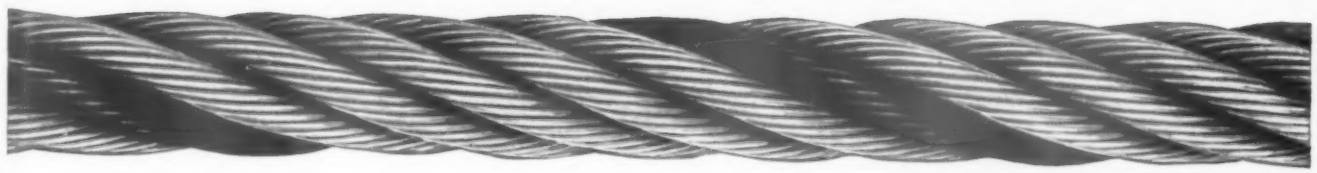
STRONG - *that's Purple Strand**



DURABLE - *that's Purple Strand**



* Purple Strand is Bethlehem's top-grade wire rope—the rope that is made in every size, type, and construction needed for foundry work. Whether you use small hoists or big overhead cranes, rig 'em with steel-sinewed Purple Strand. It will handle your ladles, flasks, and castings as if they were feathers.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation

Export Distributor: Bethlehem Steel Export Corporation

When you think WIRE ROPE . . . think BETHLEHEM

"BOY, FETCH ME A SACK OF COLLOIDAL GELATINATING SILICATE OF ALUMINA!"

what the professor means is a bag of

FEDERAL GREEN BOND

Foundrymen know also that GREEN BOND controls sand strength; it rejuvenates dead sand; it gives greater sand flexibility; it permits sand to be worked with a lower moisture content; it is the most practical method of developing and controlling green strength. That's why FEDERAL GREEN BOND is used by foundrymen every day, everywhere.

Best of the Wyoming Bentonites

THE FEDERAL FOUNDRY SUPPLY COMPANY

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NOVEMBER, 1948

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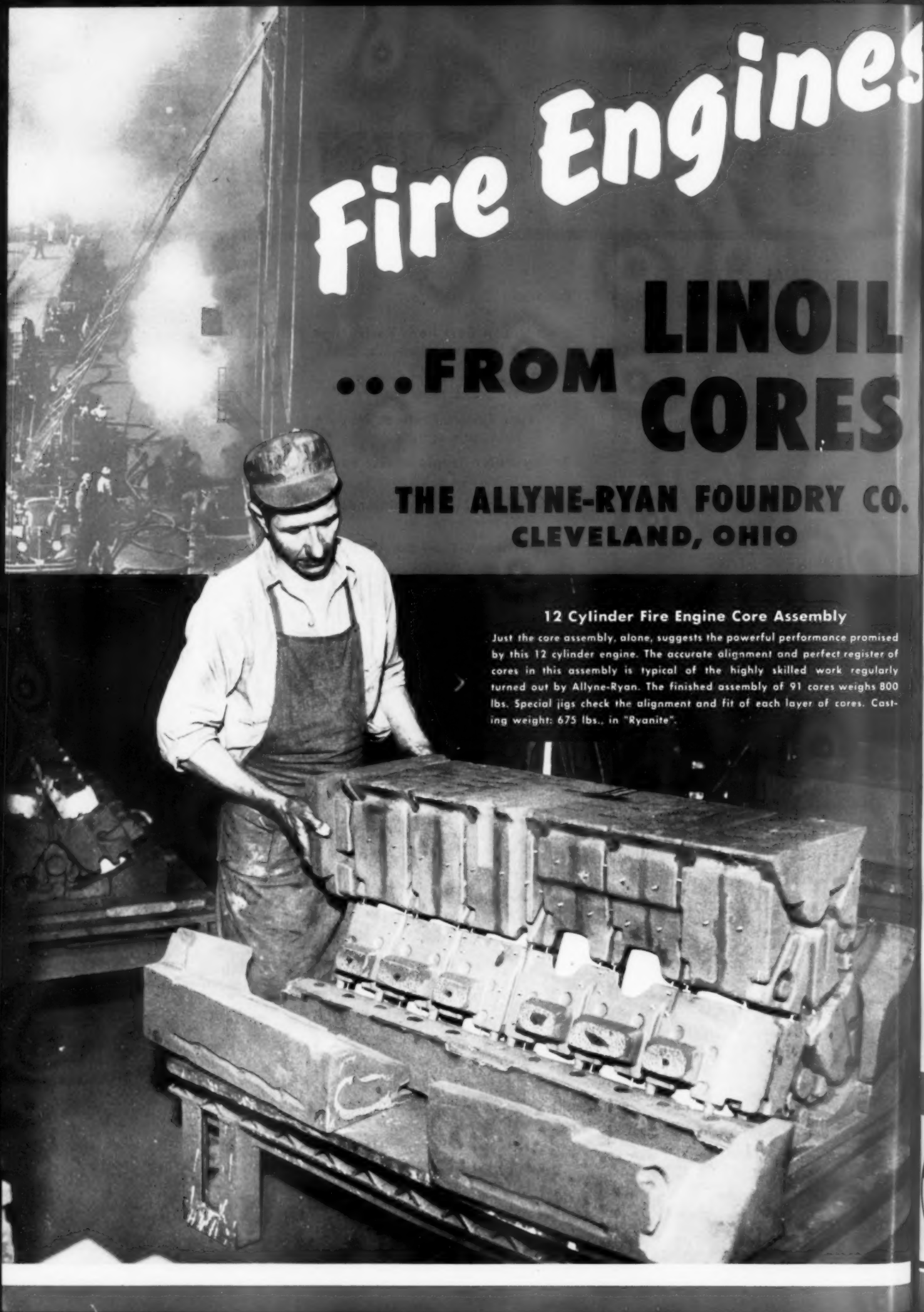
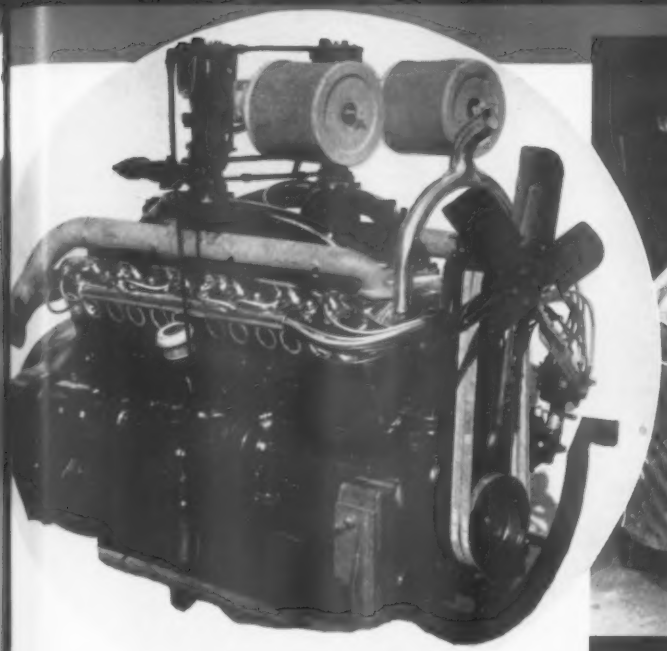


12 Cylinder Fire Engine Core Assembly

Just the core assembly, alone, suggests the powerful performance promised by this 12 cylinder engine. The accurate alignment and perfect register of cores in this assembly is typical of the highly skilled work regularly turned out by Allyne-Ryan. The finished assembly of 91 cores weighs 800 lbs. Special jigs check the alignment and fit of each layer of cores. Casting weight: 675 lbs., in "Ryanite".



Seagrave Engine Cast By Allyne-Ryan

Developing 268 horse power at 2850 R. P. M., this 12 cylinder "V"-type power plant has two independent ignition systems, two spark plugs in each cylinder, and renewable cylinder liners. For heavy duty Metropolitan pumpers—this engine drives a 18,000 lb. pumper 70 miles per hour, and is capable of pumping 2,000 gallons of water per minute at 150 lbs. pressure.

Cylinder Cores in First Stage of Assembly

The beginning of a 12 cylinder Seagrave engine core assembly. Note the number of thick and thin core sections occuring side by side. Each must withstand the heavy, penetrating metal action with unfailing durability . . . Here's where LINOIL'S uniform performance saves many a casting!

Those fast-flying fire engines that roar down our streets to safeguard lives and property . . . start life in a precision core assembly at the Allyne-Ryan Foundry. A twelve-cylinder power plant for these powerful engines is an extremely accurate and highly skilled casting job . . . involving over 91 intricate cores . . . that take two expert core assemblers a full day to properly assemble.

Cast in "Ryanite" for the Seagrave Corporation, leading fire engine manufacturers—these castings must pass rigid specifications for accuracy and soundness in order to handle the vital missions fire engines are instantly expected to perform.

LINOIL cores form the heart of these castings . . . in each assembly, perfect register and alignment of cores is checked against special jigs. LINOIL assures cylinder block cores that resist penetration . . . do not sag, shrink, absorb moisture, or crumble . . . collapse quickly for easy cleaning. For over 30 years LINOIL has produced dependable cores at Allyne-Ryan—helping to increase their reputation for top-quality automotive castings.

★ ★ ★ ★

If you have a troublesome core problem . . . please write us about it. From hundreds of daily experiences in solving core problems . . . we may have the money-saving answer you are seeking.

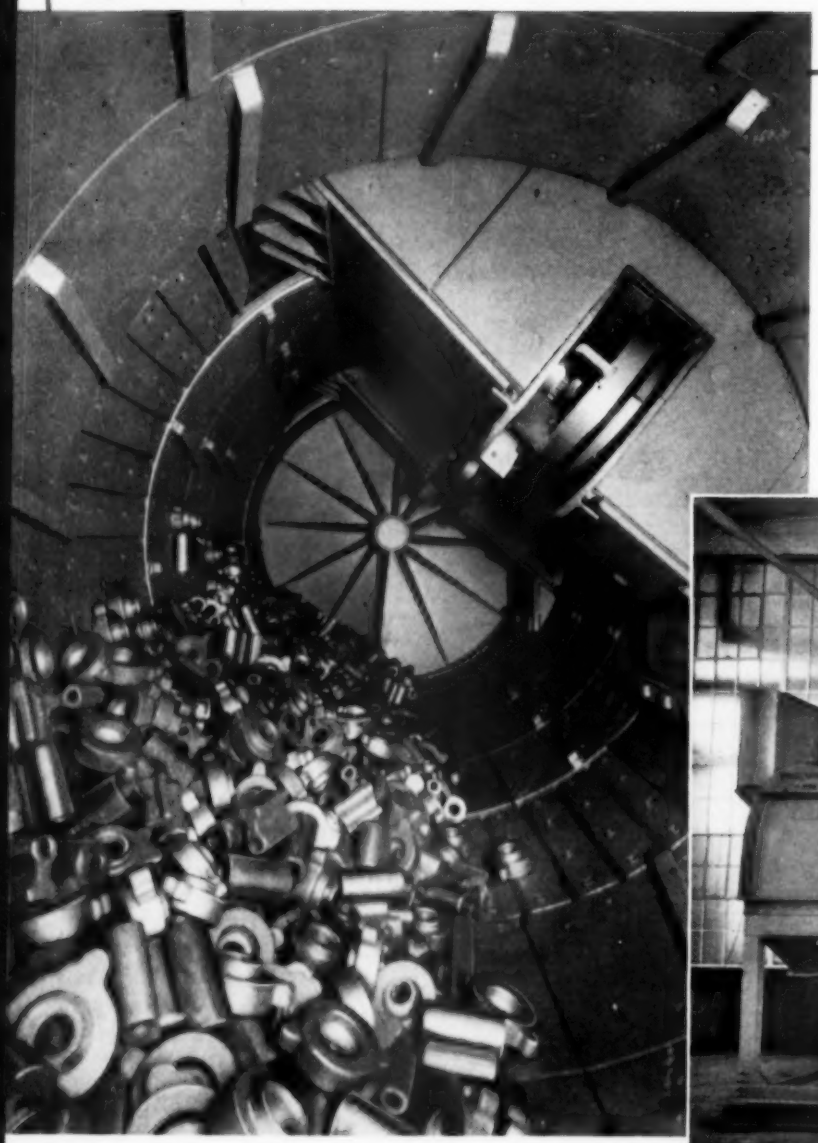
THE LINOIL — THE LOGICAL OIL

THE WERNER G. SMITH COMPANY

(DIVISION OF ARCHER-DANIELS-MIDLAND COMPANY)

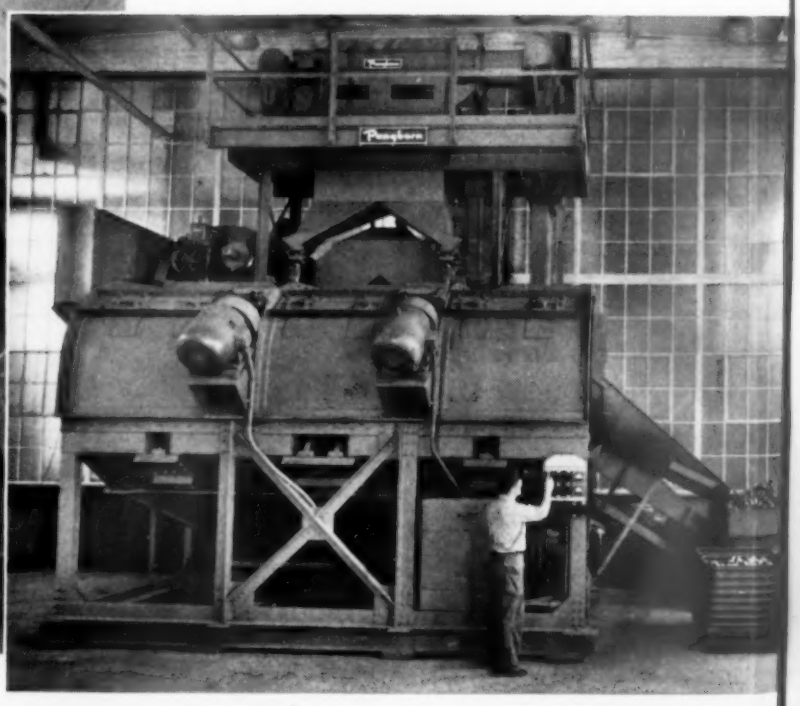
2191 WEST 110th STREET · CLEVELAND 2, OHIO

BLAST CLEANING 36¢ per ton



LEFT—Looking into the New Pangborn "Continuous-Flo" ROTOBLAST Barrel from the feed end shows the castings as they tumble-flo through the abrasive streams.

BELOW—Here's the whole installation ... the newest, most revolutionary development in blast cleaning equipment ... Pangborn "Continuous-Flo" ROTOBLAST Barrel for a new low in cleaning costs.



Pangborn

More Than 25,000 Pangborn Machines Serving Industry

This amazing new low in cleaning costs sold Grinnell Mfg. Co. on ordering a second Pangborn Continuous-Flo ROTOBLAST* after 3 months' operation at their Columbia, Pa., plant

HERE ARE THE FACTS . . .

Cleans MORE!

Cleans continuously 312 tons of assorted castings in 22½ hours . . . averages 13.8 tons per hour. One "Continuous-Flo" Barrel cleans all the work of 72 molding machines, 3 multiple pouring platforms.

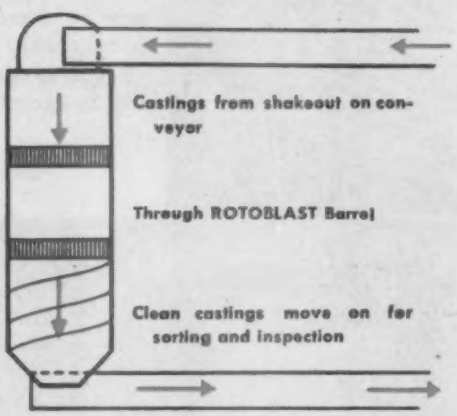
Cleans FASTER!

Castings are cleaned within 20 minutes after pouring—allowing quick inspection, thereby catching defects *early* and assuring better foundry control which results in *more good castings.*

Cleans CHEAPER!

ROTOBLAST cleans Columbia's castings for only 36c per ton. This is total cleaning cost—made up of labor, power, maintenance and abrasives.

HERE IT IS IN THE PRODUCTION LINE AT COLUMBIA



REPEAT ORDERS PROVE VALUE

Yes, at Columbia Malleable Castings Division of Grinnell Manufacturing Co., the performance of the Pangborn Continuous-Flo ROTOBLAST was so spectacular in cleaning a variety of castings, that Grinnell has placed an order for a second machine to match this record at their Cranston, Rhode Island, plant. This remarkable new Pangborn innovation fits uniquely into any automatic foundry materials handling operation; blast cleaning and discharging virgin metal castings on to a conveyor that feeds sorting, grinding and inspection operations.

*Trademark of the Pangborn Corporation

WRITE TODAY for complete details about the Pangborn "Continuous-Flo" ROTOBLAST Barrel. For all the latest developments in Blast Cleaning and Dust Control equipment — come to Pangborn. PANGBORN CORPORATION, 1400 Pangborn Boulevard, Hagerstown, Md.

BLAST CLEANS CHEAPER with the right equipment for every job

MEET THE NEW CHAMPION

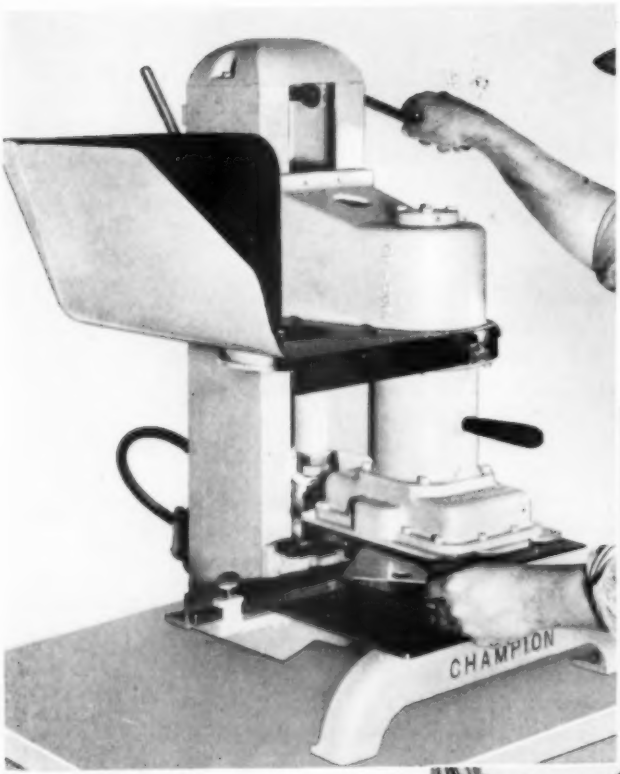
Face to F

Shake Hands with

(MODEL CB-

and see wha

A Wi



ON YOUR MARK...

To adjust the vertical clearance, place the clearance gauge on top of the core box, bring down the blow head until it touches the gauge, then tighten the clamp.

GET SET...

To adjust side clamps, place clearance gauge on the right side of core box, adjust clamp jaw by means of the hand crank. In actual operation the clamping is automatic.

NO TOOLS* NEEDED

IN SETTING UP OR ADJUSTING

One of the biggest advantages of the Champion "Junior" is the provision for rapid change over. Short runs are produced as economically as long, because getting ready is a mere matter of seconds. No screw drivers or wrenches are needed. No bolts, screws or latches need be loosened or tightened. Blow plate and base plate are removed and replaced in an instant! Box clamps are spaced to receive any box with a few quick spins of the handles.

(**Except gauge*)

Face!

with "JUNIOR"

(CORE BLOWER)

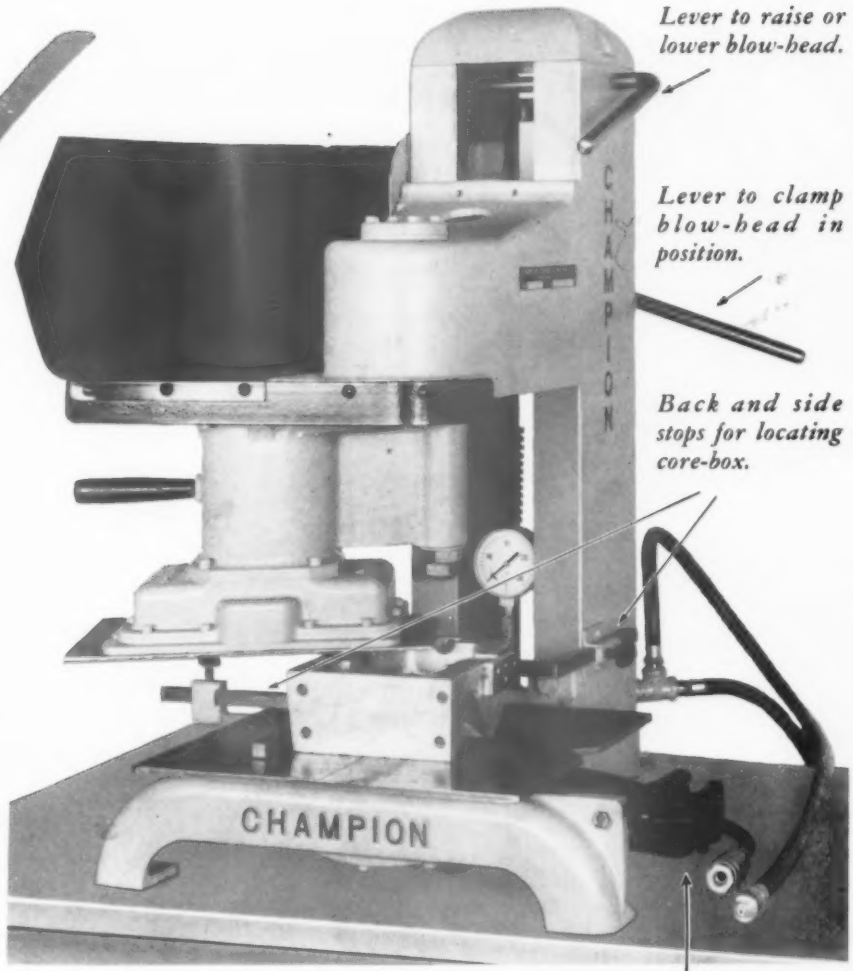
makes him A WINNER!

To the right is a candid, unretouched photo of the newest model Champion core blower, the CB-5. Resting on the table is an open top core box. With sand in the hopper and the air hooked up, it is ready, just as you see it, to turn out uniformly satisfactory cores as fast as you can take them away!

No extras, no separate parts, no booster needed! ***(85 pounds of air is ample pressure for any Champion.)***

.....GO!

Interested in keeping costs down, quality up? Get in touch with our production specialists, let them show you how easily you can gain the benefits of the Champion method. There's a place in every modern foundry for Champion Molding Machines and Core Blowers.


Lever to raise or lower blow-head.
Lever to clamp blow-head in position.
Back and side stops for locating core-box.
CHAMPION
CHAMPION
One air valve performs complete cycle of operations.

The Champion CB-5 can be placed on any bench, takes up no more room than a hand core maker, multiplies one man's output tremendously. See views on opposite page indicating speed and simplicity of set-up.

Champion core-blowers, from the huge CB-400 down to the newest, the CB-5, all make use of the distinctive Champion blow valve. This feature is your guarantee of absolutely perfect cores, every time. With the safety interlock between clamping and blowing action, accidents and irregularities in performance are made impossible. The development of the "Junior" Champion extends the advantages of the Champion method to every size foundry. Even on short runs, it pays to use this machine because cores are uniform and produced at lowest cost. "Junior" requires practically no set up time and effects material economies on short as well as long runs.

For full details, write for copy of our New Bulletin.

CHAMPION FOUNDRY AND MACHINE COMPANY
GENERAL OFFICE AND PLANT, ROCKFORD, ILLINOIS
SALES OFFICE: 1513 W. MADISON ST., CHICAGO 7, ILL.
MOLDING MACHINES • CORE BLOWERS • ELECTRIC RIDDLES

A/B Westin & Backlund
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W. F. Guth Industrial Equipment & Furnace Co.
Avenida R. S. Pena 852
Buenos Aires, Argentina

Mauricio Hochschild & Cia. Ltd.
Casilla 153 D
Santiago, Chile

Thor ANNOUNCES THE ½" Silver Line DRILL

Much Smaller

Much Lighter

Far More POWERFUL!

The World's Most Advanced ½" ELECTRIC DRILL

INDEPENDENT PNEUMATIC TOOL COMPANY

Aurora, Illinois

Export Division: 330 West 42nd St., New York 18, N. Y.

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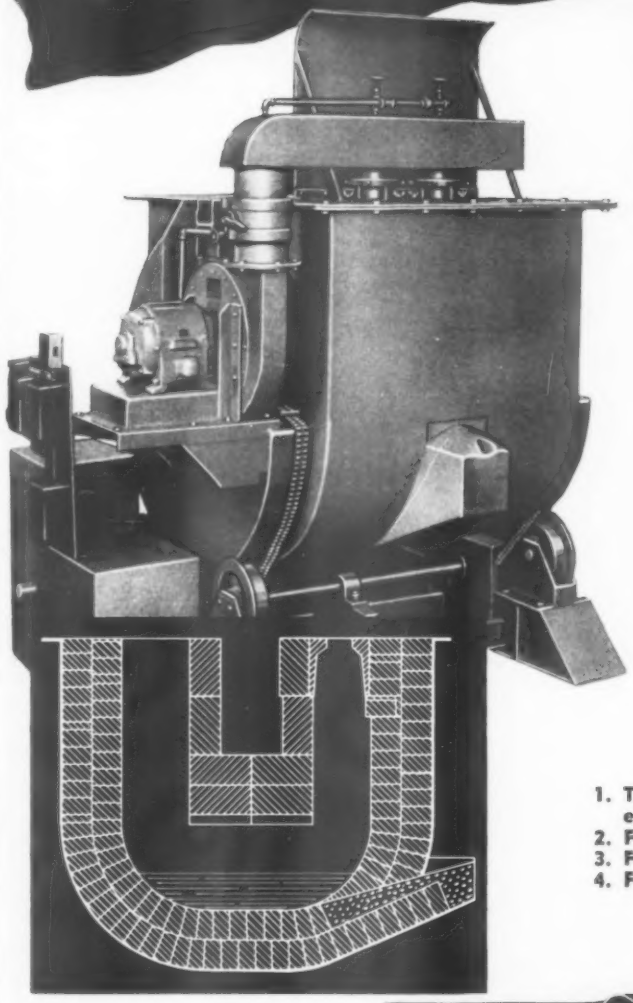
Thor PORTABLE POWER TOOLS

PNEUMATIC TOOLS • UNIVERSAL AND HIGH FREQUENCY ELECTRIC TOOLS • MINING AND CONTRACTORS TOOLS

FIRST SHOWING!

The New Stroman "U" Type Reverberatory DIRECT FIRED FURNACE



This furnace is a recent development that has come about as the result of the Stroman Furnace & Engineering Company's wide experience with open flame Reverberatory type metal melting furnaces. Results show that a great deal can be accomplished with this type of furnace, particularly for high temperature work on ferrous alloys, monel, nickel silver, brass and bronze alloys.

We feel certain that this furnace can be operated with lower metal losses in brass alloys than any other type of furnace. On the ferrous metals such as gray iron, gray iron alloys, the ferro-alloys such as ferro-silicon, and ferro-manganese, excellent results have been obtained.

This furnace can be supplied as gas fired, oil fired or with combination burners with which it is possible to switch very simply from either gas to oil and vice-versa.

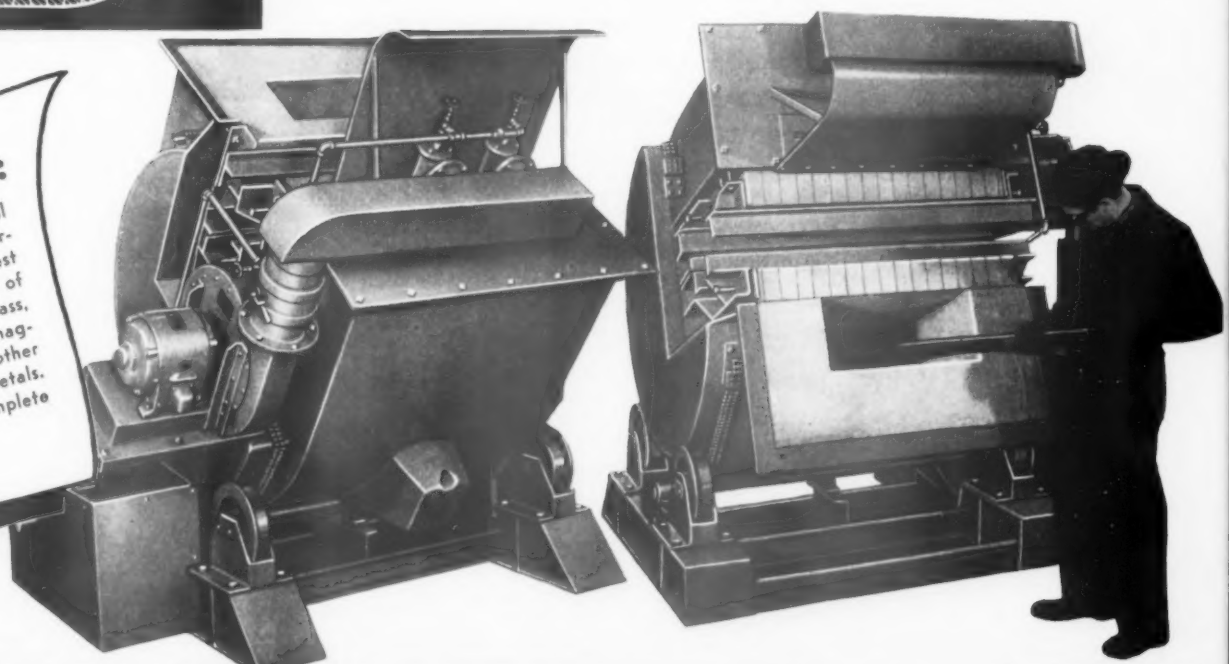
This furnace was designed and developed keeping the following outstanding features in mind:

1. **To improve working conditions by elimination of heat.**
2. **For ease of charging.**
3. **For ease of skimming.**
4. **For ease of alloying.**
5. **For ease of repairing.**
6. **Lower Fuel consumption.**
7. **Longer lining life. (Less repairs.)**
8. **Better control of atmosphere.**

Built in Sizes to Meet Your Needs

REMEMBER:

Stroman makes all types and sizes of furnaces for the finest and fastest melting of iron, iron alloys, brass, bronze, aluminum, magnesium and all other non-ferrous metals. Write for complete literature.



STROMAN FURNACE & ENGINEERING CO.

DIVISION OF

THE PETERSEN OVEN CO. • 9900 FRANKLIN AVE. • FRANKLIN PARK, ILL.

IT'S *New*... IT'S *Different*...

DELTA BLAKOAT S-5

CORE AND MOLD WASH

Delta Blakoat S-5 Core and Mold Wash, for grey iron castings, is a product of scientific research, conducted by Delta Foundry Research Laboratory in cooperation with one of the leading grey iron foundries in the mid-west. It's development solves critical difficulties, inherent in grey iron casting, which have persistently plagued foundrymen and foundry technicians.

Delta Blakoat S-5 is a distinctly new and different wash. It provides all of the well-known advantages of other Delta Core and Mold Washes plus the added advantages listed on the right.

Write for complete information. If you wish it we will send a liberal working sample to you for test purposes in your foundry.

IT'S *New*... IT'S *Different*...

1. It's new and different. It has qualities and characteristics contained in no other wash. It substantially reduces cleaning room costs and greatly improves casting finish.

2. It produces results, on grey iron castings, unequalled by any other wash. It will not deform cores. Edges and corners remain clean and sharp.

3. It costs less to buy and is considerably more economical because you use it at a lower Baume.

4. It can't flake or peel because it anchors itself by penetrating onto the sub-surface sand grains of cores and molds. It greatly increases the surface hot strength of the sand which prevents veining and metal penetration.

5. It is easily applied and adheres to any sand surface . . . green or dry . . . and produces a smooth, highly refractory, waterproof surface over which molten metal flows faster and without interruption.

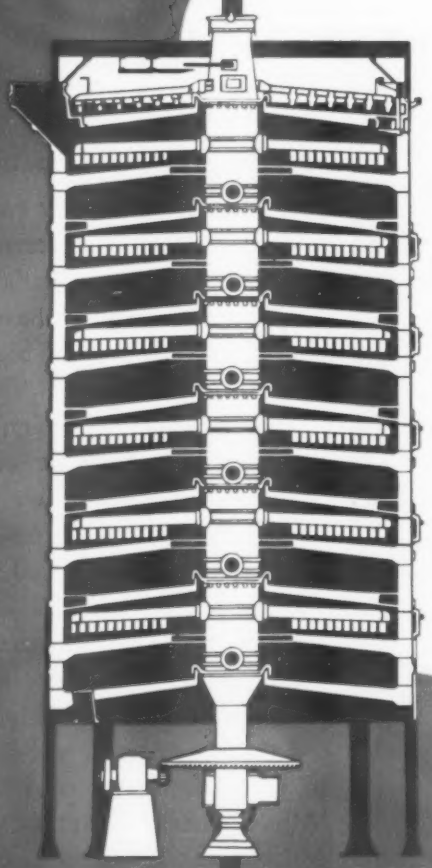
DELTA OIL PRODUCTS CO.

MILWAUKEE 9, WISCONSIN

Nerco

sand reclaiming units

HOW MUCH IS YOUR USED SAND WORTH?



Foundries which discard used sand—consider it without worth. Foundries which reclaim their used sand, i.e. remove the undesirable fines, clay and organic matter, get a sand that not only looks new but works like new sand.

Which is better business—buy new sand, use it once, then discard it—or reclaim the used sand and use it over and over again?

NICHOLS sand reclaiming units accomplish this cleaning operation with a minimum of labor and maintenance costs. A choice of methods insures each installation the utmost in economy and quality of product.

Our experience as equipment suppliers to the metallurgical industries for many years, and our complete engineering services assure efficient, practical design and proved equipment.

Write for a survey of your requirements, without obligation. A NICHOLS engineer will be glad to call and make recommendations for the most suitable system for you. A letter will do it.

NICHOLS ENGINEERING & RESEARCH
CORPORATION
60 WALL TOWER — NEW YORK 5, N. Y.
In Canada: University Tower Bldg. Montreal

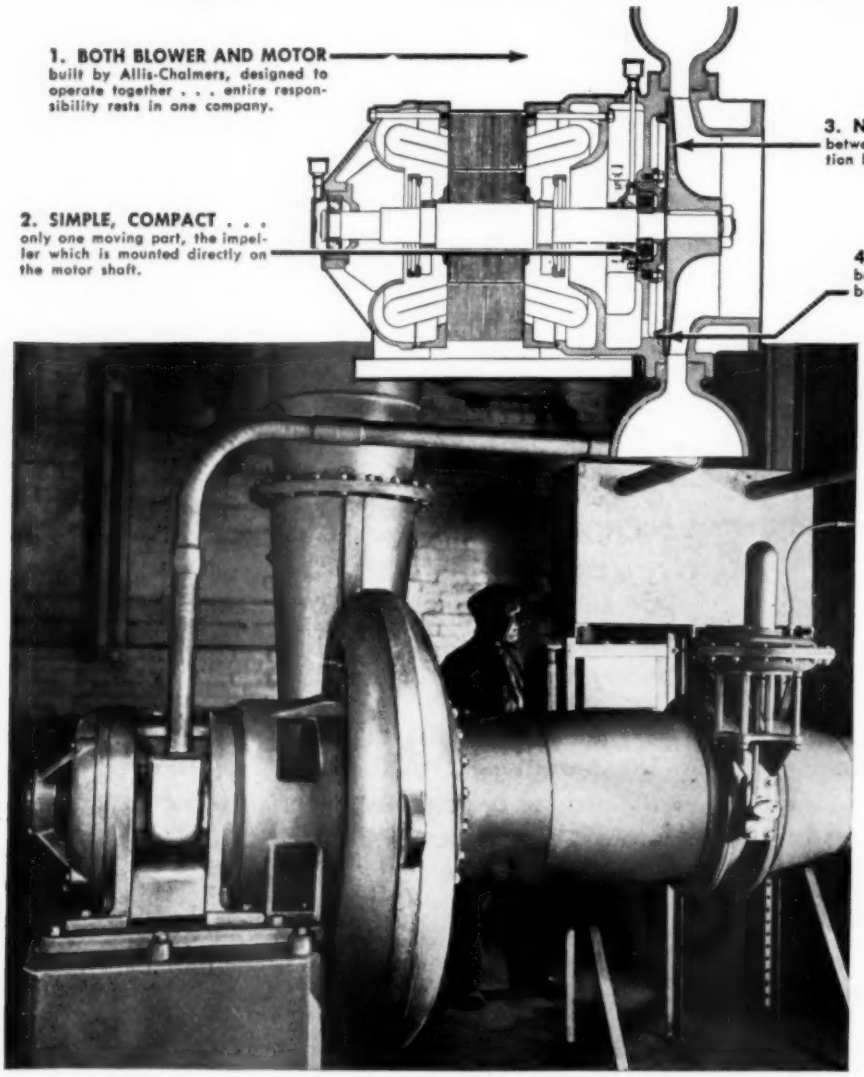
Specify Allis-Chalmers Cupola Blowers - *IT PAYS!*

1. BOTH BLOWER AND MOTOR built by Allis-Chalmers, designed to operate together . . . entire responsibility rests in one company.

2. SIMPLE, COMPACT . . . only one moving part, the impeller which is mounted directly on the motor shaft.

3. NO METAL TO METAL CONTACT between moving parts. Heavy, anti-friction bearings are the only wearing parts.

4. SEAL RING ON IMPELLER balances end thrust . . . reduces bearing loads to a minimum.



Foundrymen, Consultants:

ONE OF THE BIGGEST FACTORS in overall cupola operating economy is the blower. That's why it's just sound business to have all the facts about all types of blowers before you go ahead.

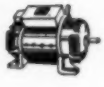
For example: The design of *Allis-Chalmers* cupola blowers stems from over *60 continuous years* building high speed rotating equipment. Hundreds have been installed, and the very first units are still operating. Users say A-C blowers are easy to maintain . . . low in operating cost . . . that they have unusually long life.

So compare *before* you buy, prove to yourself that "it pays to specify 'Allis-Chalmers'." ALLIS-CHALMERS, MILWAUKEE 1, WIS. A 2294

A-C BUILDS BASIC MACHINES, BLOWERS, PUMPS, DRIVES, ELECTRICAL EQUIPMENT FOR FOUNDRIES

ARC FURNACE transformers in any size for any furnace application. Five separate tap positions and a change from Delta to Wye connection give a wide range of voltages.

REGULEX* CONTROL for arc furnaces lowers and raises electrodes in response to rapidly changing conditions of the furnace charge. It makes possible lower cost melts, reduces electrode breakage.



COMPLETE LINE of motor controls for every requirement of motor operation. Manual or magnetic, reversing and non reversing, across the line or reduced voltage, single or multi-speed.

SEND FOR BULLETIN 07B6092A, "Foundry Mechanization" — It's packed with helpful, usable information on the *entire* Allis-Chalmers line of heavy foundry equipment.

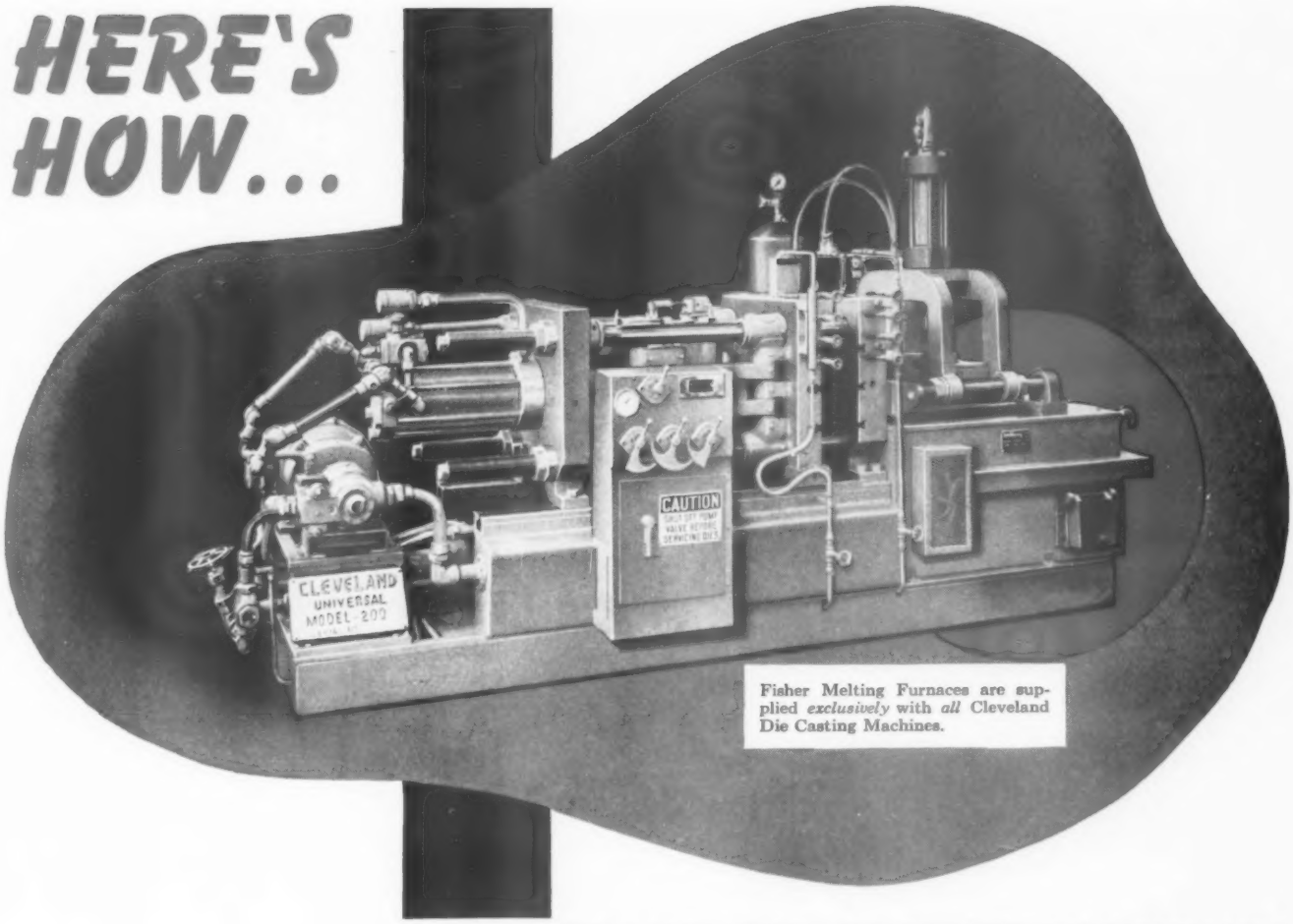
*Allis-Chalmers Trademark

ALLIS-CHALMERS

One of the Big 3 in Electric Power Equipment — Biggest of All in Range of Industrial Products

A CENTURY OF SERVICE to Industry THAT MADE America Great

HERE'S HOW...



Fisher Melting Furnaces are supplied *exclusively* with *all* Cleveland Die Casting Machines.

...CLEVELAND DIE CASTING MACHINES

MELT METAL

Fisher Melting Furnaces are supplied *exclusively* with *all* die casting machines manufactured by Cleveland Automatic Machine Company. Fisher Melting Furnaces are *built-in* as an integral part of all Cleveland Automatic *zinc* die casting machines.

John Prohaska, Vice President and Sales Manager of Cleveland Automatic Machine Company says: "We find it a distinct advantage to be able to supply our die casting machine customers with *any* type of melting furnace. It is important to our customers and ourselves that we can ship Cleveland Die Casting Machines as complete packaged units."

HERE'S WHY...

★ **Fisher builds every type of melting furnace**—oil, gas, electric or electric induction for melting aluminum, magnesium, zinc or brass. Thus Cleveland Automatic can supply with their die casting machines, the type of melting furnace best suited to their customer's individual requirements.

★ **The Fisher Service Department is nation-wide**—with Service Men permanently located in or near your city. Maintenance parts are easily and quickly secured.

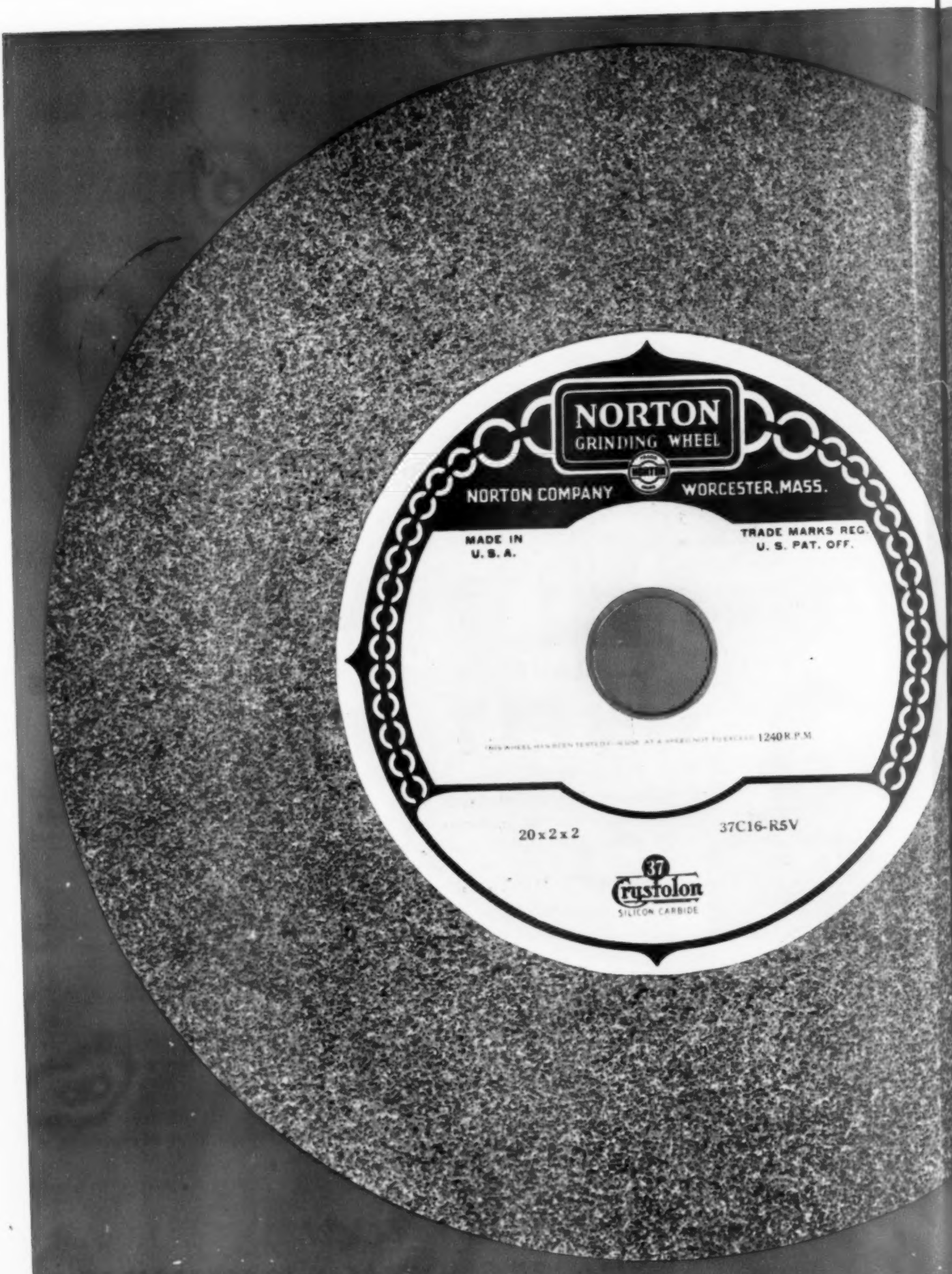
★ **Fisher Furnaces are standard units**—not special furnaces. They are proven and trouble-free as a result of Fisher's 27 years experience in the manufacture of melting furnaces.

For detailed information on Fisher Furnaces write your nearest Fisher or Lindberg office.

Fisher Furnaces

A DIVISION OF LINDBERG ENGINEERING CO.

2453 West Hubbard Street, Chicago 12, Illinois


NORTON
GRINDING WHEEL
NORTON COMPANY
WORCESTER, MASS.
MADE IN
U. S. A.
TRADE MARKS REG.
U. S. PAT. OFF.
1240 R.P.M.
20 x 2 x 2
37C16-R5V
37
Crystolon
SILICON CARBIDE

NORTON Wheels Can Cut Your Foundry Grinding Costs!

Because They're Made to Fit Each Different Grinding Job . . .

with the Right Abrasive

NORTON Wheels for foundry and other rough grinding jobs are available with four different abrasives, trade-marked, ALUNDUM, 57 ALUNDUM, 32 ALUNDUM, and 37 CRYSTOLON. When you select a NORTON Wheel for a specific grinding job, you have this variety of abrasives to choose from — each with different qualities and characteristics. You may select an abrasive which **fits** your particular job — which offers the fastest, cleanest cut, the longest life, and which removes maximum metal at minimum cost.

with the Right Bond

Selecting the right bond for a particular grinding operation is equally as important as selecting the right abrasive. When you select a NORTON Wheel you have a choice of bond as well as a choice of abrasive. From the four types of bond available — our newer **Resinoid types B-5 and B-7,** and also Vitrified, Shellac, and Rubber — you can select one which best **fits** your grinding job — one which will produce the cleanest, smoothest cutting action.

and with the Right Treatments

Certain grinding conditions require wheels which have been specially "treated". NORTON has a variety of special treatments available which insure good results

NORTON COMPANY
WORCESTER 6, MASS.
Distributors in All Principal Cities

NORTON ABRASIVES

Making Non-Ferrous Castings?

Use SAFE, Reinforced NOR-FLEX Cut-off Wheels for Removing Gates and Risers!

These new wheels of tough, sharp ALUNDUM abrasive and special resinoid bond stand up without coddling, and won't fly into pieces with every twist or bend. Details on request.

Use CASTFLUX TRADE MARK REG. **THE "NATIONAL" DUAL PURPOSE FLUX** *for Both...*

Get FLUIDITY

- Closer Grained Castings
- Fewer Rejects
- Fewer Miss Runs
- Less Remelting
- Longer Ladle Life
- Less Ladle Chipping

at a cost of 10¢ to 15¢
per ton of metal treated.

IN THE LADLE...

CASTFLUX increases Fluidity materially by cleansing and purifying the metal bringing to the surface occluded oxides, gases, slag, dirt, and other foreign matter, offsetting the negative factors of inferior scrap and coke.

•

ON BOTH BLIND AND OPEN RISERS...

CASTFLUX raises the temperature of the metal to a higher degree and substantially increases and maintains the fluidity of the metal during the entire cooling-down period.

Give Castflux a trial in your plant. You'll be highly gratified with the results. Write for prices, complete data.

#1 IN THE LADLE

CASTFLUX TRADE MARK REG.

#2 ON BOTH OPEN AND BLIND RISERS

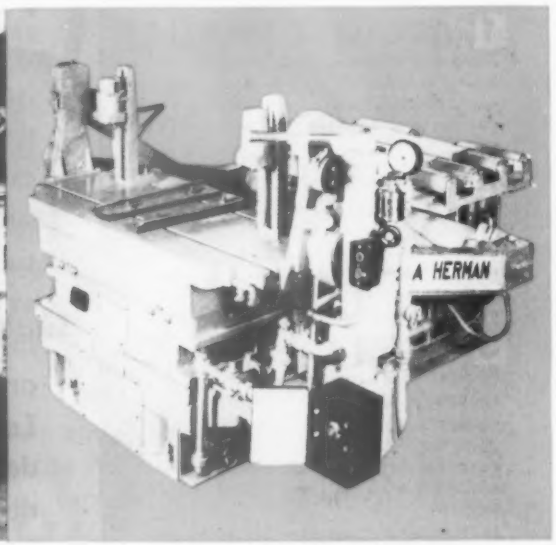
UNCONDITIONALLY GUARANTEED

Unless Castflux meets with your full approval material can be returned, providing we are notified within 30 days after receipt of material.

NATIONAL PIGMENT COMPANY
2115-2117 EAST YORK STREET
PHILADELPHIA 25, PENNA.

"This Foundry is A Good Place to Work"

LEBANON STEEL FOUNDRY



Located since 1912 in the pleasant Lebanon valley, in the heart of Pennsylvania, this plant produces a wide range of quality steel castings. It is a pioneer in electric furnace melting.

It is a good place to work for other reasons: Concrete flooring is used throughout the foundry; complete chemical control is provided for all materials; a policy of cleanliness amounts to a hobby with Lebanon management; excellent overhead lighting supplements continuous windows along both sides of the plant; modern molding methods prevent congestion and promote safety; an elaborate sprinkler system makes the plant as fireproof as possible.

A number of our molding machines are used in this outstanding foundry. The 750 lb. Herman illustrated is typical. Operating features include: hydraulic pattern drawing; automatic equalizer to compensate for flask and bottom board irregularities; automatic lubrication; one rotary valve handle controls complete operation.

Wire, call or write the address below for complete details. Remember — Herman's range of machines are manufactured in capacities up to and including 140,000 lbs.

Herman MOLDING MACHINES

HERMAN PNEUMATIC MACHINE CO., UNION BANK BUILDING, PITTSBURGH, PA.

"Electro" serves:

METAL AND CERAMIC INDUSTRIES

Non-Ferrous and Ferrous Foundries; Steel Mills and Smelters; Brass Rolling Mills; Heat Treaters and Annealers; Potteries; Art Potteries; Grinding Wheel; Sanitary Ware; Floor and Wall Tile; Electrical Porcelain; and miscellaneous Ceramic Plants.

THE AUTOMOTIVE, CHEMICAL, SHIPBUILDING

and Utilities Industries as well as Federal, State and Municipal Agencies.

with

1 ABRASIVE WHEELS

Abrasive Wheels—Resin-bonded, High-Speed Grinding Wheels to cover nearly every conceivable use from snagging and cutting operations to fine precision grinding.

2 CRUCIBLES

Crucibles, (Tercod-Conqueror) Pedestal Blocks and Pot Lids—The Carbon-bonded Crucible for melting aluminum—nickel—copper—the brasses and bronzes—zinc—silver—gold—iron, using any fuel: oil, gas, coke or coal, electricity.

3 REFRACTORIES

Special Refractories—Electric furnace refractories of all kinds used for:

Ceramic Kiln Furniture—Slabs and Posts for rigid, floating or semi-floating open construction; plate setters, tile setters, sanitary ware setters and silicon carbide saggers.

Muffles and Hearths—One piece and sectional for enameling furnaces, tunnel kilns, assay and heat treating furnaces, pottery kilns.

Crucible Furniture—Linings, covers.

Pyrometer Tubes—And tubes for other purposes.

Brick—9" series or special shapes to individual specifications.

Burner Blocks—And for electric furnace door blocks, door frames, port blocks and electrode sleeves.

Stopper Heads—For steel ladles; also slag hole and tap hole blocks for Cupolas.

4 CEMENTS

Cements and Ramming Compositions—Of special refractories used by all industries; monolithic linings for electric, gas and oil furnaces; patching furnace walls, laying brick, boiler setting and ladle linings.

5 ALLOYS

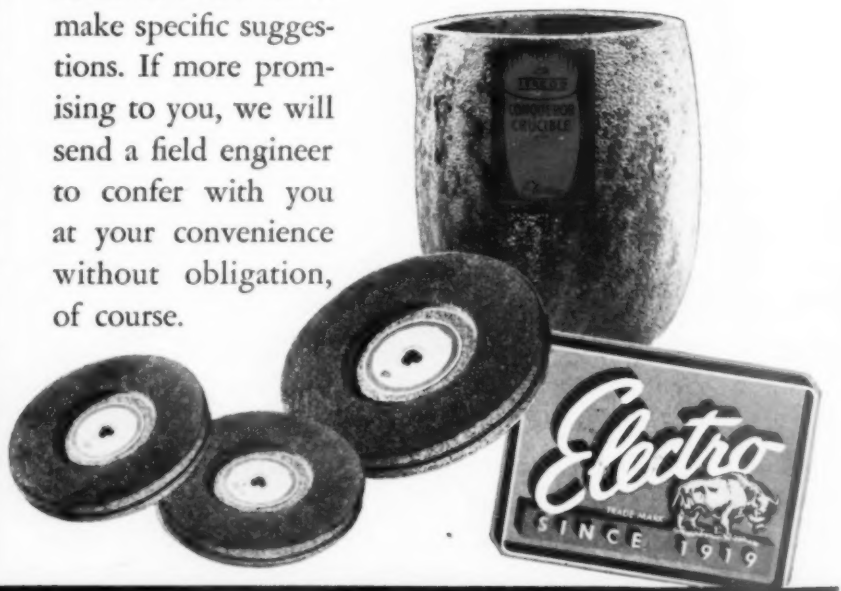
ALLOYS—Special compositions for additions, deoxidation, degasification, purification: Copper—Aluminum—Chromium—Titanium—Nickel—Silicon—Magnesium—Iron—Lithium—Calcium—Calcium Boride—Tin—Zinc—Lead.

...IF YOURS IS AN *Exacting* INDUSTRY

LET THIS CHECK LIST GUIDE YOU TO RELIABLE NEW SOURCES

- ✓ ABRASIVE WHEELS
- ✓ CRUCIBLES and REFRACTORIES
- ✓ CEMENTS and ALLOYS

VOLUME is as attractive to us as to any industrialist. But because we elected to supply, in addition to standardized items, products and services outside the capacities of mass-producing suppliers, our volume results cumulatively on many specialties. Therefore, if the kind of product you require is not apparently available, we have, in all probability, what you want in our regular line. If not, perhaps we can re-engineer or originate needed items to your special requirements. Let our product list at the left serve as a general index to the possibilities and then write us in enough detail to allow us to make specific suggestions. If more promising to you, we will send a field engineer to confer with you at your convenience without obligation, of course.



Electro Refractories & Alloys Corporation

344 DELAWARE AVE. BUFFALO 2, N. Y.

West Coast Warehouse LOS ANGELES

DELIVER CLEAN, DRY AIR

TO CORE BLOWERS, MOLDING MACHINES, ETC.

by this exclusive method!

No MOVING PARTS

No FILTERS TO REPLACE

No GUESSWORK

Model "E" has five separating units. Each unit is made up of a special corrosion-resistant cast aluminum alloy. The entire separator is 8" in diameter, 18" high, having 1½" standard pipe connection. All parts accurately machined and synchronized to control air action.

Cross section of centrifugal separating unit

Plant engineers and foundry superintendents prefer CMD Textite Air Separators because their accurately rated capacities can be depended upon for required C.F.M. volume to clean air and thoroughly dry it. They are not mainliners. They should be installed at or near the point of use, which is the most effective place to clean air. Installation instructions are packed with each separator. Tables as well as technical information and bulletins are available for the correct operation of core blowing machines. Write for this data today.

MADE IN FOUR SIZES

MODEL	CAPACITY	SIZE	PIPE SIZE
N	25-CFM	5" x 10"	½"
W	50-CFM	6" x 12"	¾"
S	75-CFM	7" x 15"	1"
E	250-CFM	8" x 18"	1½"

CHICAGO MANUFACTURING & DISTRIBUTING CO.

Industrial and Foundry Equipment

1928 WEST 46th STREET — CHICAGO 9, ILLINOIS

"The Moulders' Friend" Fits Your Foundry

This compact sand conditioner is carried about the foundry on two wheels. It turns short and rolls easy and is so simple that anyone can operate it.

As The Moulders' Friend propels itself over the heap thousands of flat, tempered steel wires in the brush revolving at high speed pick up small particles of the used sand, added bond and moisture and blend them thoroughly. The process is so thorough that either clay bond or new moulding sand is blended with the heaps successfully and a minimum of moisture is required.

Hand shoveling is eliminated. Capacity is over one ton per minute.

This compact, simple machine fits your foundry. It is easy to use and easy to buy.

Write for further particulars.

"The Moulders' Friend"

Sand Conditioning Equipment
Dallas City, Illinois

Built for the Foundry by Foundrymen!

All along the production line of the vast Black, Sivalls & Bryson plant, the master hand and eye of the experienced foundryman has control. Your foundry flasks are precision tools, and B S & B craftsmen and modern facilities make them so. Huge forming presses shape the steel to exact tolerance required in your specifications.

Welders with the finest electric arcs produce welds as strong as the metal itself. Yet B S & B Flasks are lighter, easier to handle. Hydraulic presses remove any distortion, make drag and cope perfectly true. Both parting line and strike-off side of each section is carefully ground to provide a tight-level joint between sections.

Twin drills place pin lugs with meticulous care. Inspections are made after each step, and only the perfect flask gets through.

Investigate for yourself the distinct advantages of B S & B Welded Steel Foundry Flasks. Call your nearest distributor, or write today for complete information.

BLACK, SIVALLS & BRYSON, INC.

Special Products Division

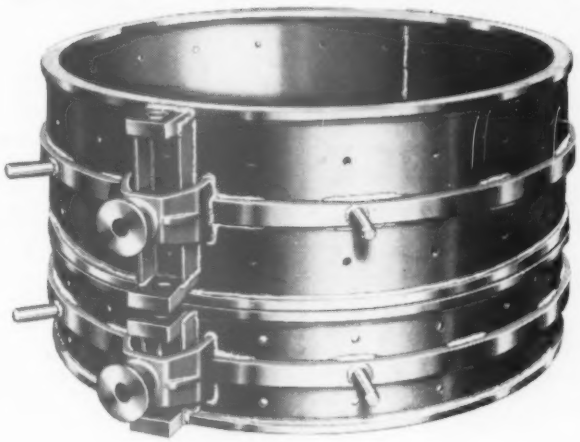
Power and Light Bldg., Kansas City 6, Mo.

AUTHORIZED BS&B DISTRIBUTOR

- B S & B Bottom Boards and Core Plates can also add speed to your production. Ask for them.

BS&B

WELDED STEEL FOUNDRY FLASKS



- GREATER STRENGTH, LESS WEIGHT
- SAVE TIME AND LABOR . . .
- BUILT TO YOUR ORDER ANY SHAPE OR SIZE FOR EVERY PURPOSE.
- RAPID DELIVERY ASSURED

ORDER TODAY
om Your Nearest Distributor

MINGHAM, ALA.
ndry Service Co.

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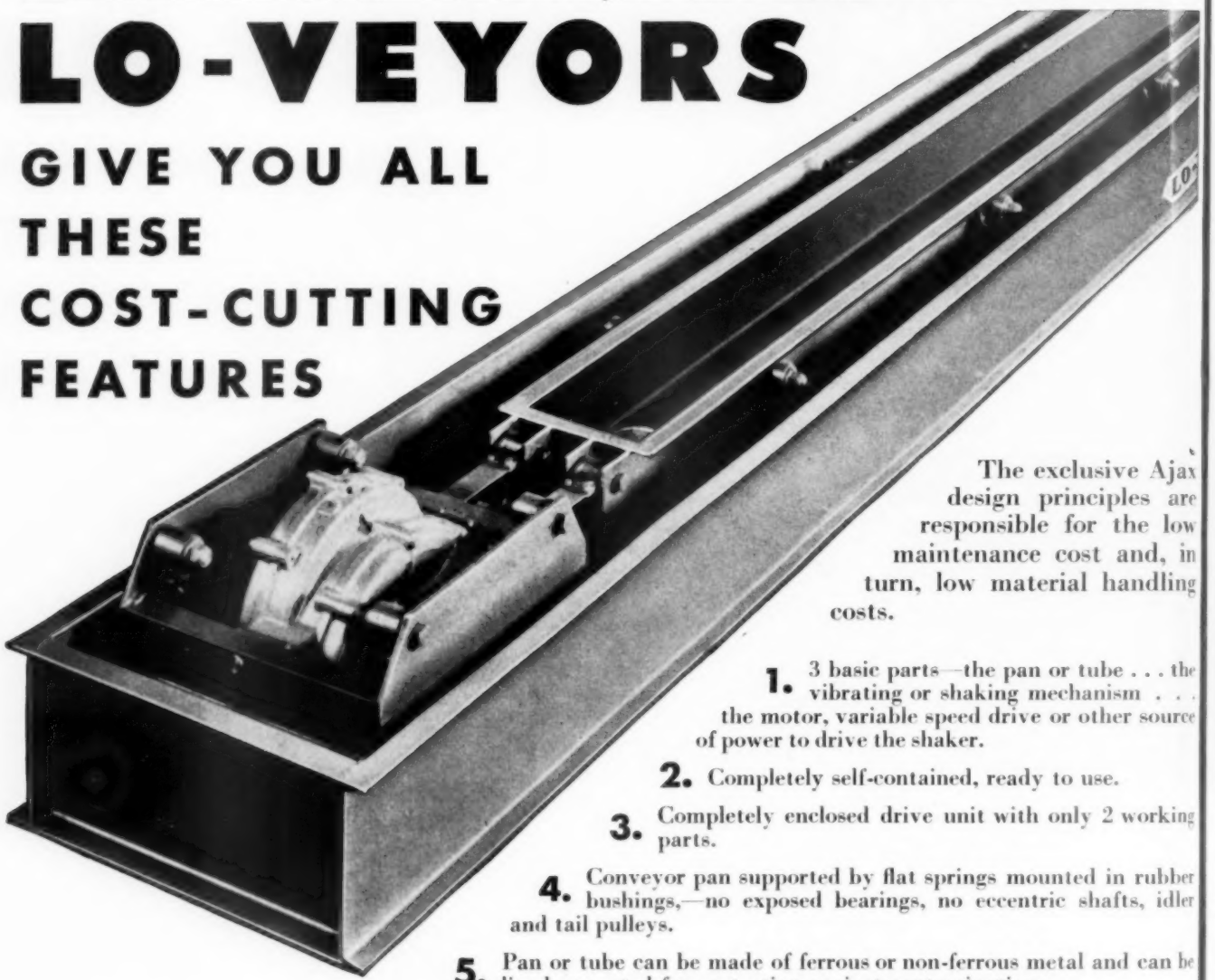
Only AJAX

LO-VEYORS

GIVE YOU ALL THESE COST-CUTTING FEATURES



The exclusive Ajax design principles are responsible for the low maintenance cost and, in turn, low material handling costs.

1. 3 basic parts—the pan or tube . . . the vibrating or shaking mechanism . . . the motor, variable speed drive or other source of power to drive the shaker.
2. Completely self-contained, ready to use.
3. Completely enclosed drive unit with only 2 working parts.
4. Conveyor pan supported by flat springs mounted in rubber bushings,—no exposed bearings, no eccentric shafts, idler and tail pulleys.
5. Pan or tube can be made of ferrous or non-ferrous metal and can be lined or coated for protection against contamination.
6. Pans available with or without covers.
7. Tubular conveyors provide gas-tight construction for critical process and explosive operations.

Write giving outline and sketch of your requirements for handling dry aggregates.

AJAX FLEXIBLE COUPLING CO. INC.

CONVEYOR AND SCREEN DIVISION • WESTFIELD, N. Y.

ALLIS-CHALMERS

"Certified" Service

A BREAKDOWN on this 39-year-old Allis-Chalmers fan motor crippled operations at the plant of an important midwest electric utility. Immediate repair was vital. The Chief Engineer called the nearest Allis-Chalmers Certified Service shop. They picked up the rotor and returned it ready for service in less than twenty-four hours.

This is the kind of emergency cooperation you can expect from every Allis-Chalmers Certified Service shop. On everyday repairs and maintenance too, your Allis-Chalmers Certified Service shop will give you prompt service on Allis-Chalmers motors, pumps and transformers, using factory approved methods and parts. Every Allis-Chalmers Certified Service shop has been selected for skilled, personal, careful workmanship, adequate equipment and *service mindedness.*

HOW TO FIND NEAREST SERVICE SHOP

Allis-Chalmers Certified Service shops are located in major industrial centers throughout the country. New shops are being appointed continuously and most smaller centers will soon be covered. To find the shop nearest you, call your closest Allis-Chalmers District Office. A 2543

MOTOR DELIVERIES GREATLY IMPROVED

Many types of Allis-Chalmers Motors are now in stock! Many other types are available on short delivery! For motors from 1 to 200 HP, check your nearest Allis-Chalmers Authorized Dealer. For motors larger than 200 HP, check with the nearest District Office. You may be able to get what you need sooner than you think.

ALLIS-CHALMERS, 1032A SO. 70 ST.
MILWAUKEE, WIS.

ALLIS-CHALMERS

Pioneers in Power and Electrical Equipment from Generation through Utilization

How a NI-ROD build-up saved a 3-month lay-up

From Canada comes the story of how the cast iron main gear of a big power shovel, made in England, had stripped 74 of its 76 teeth.

Getting a new gear meant a delay of 3 to 4 months... and the shovel was urgently needed. So, the owners called the Bowers Machine Company of Canada to repair the present gear.

Welding seemed the only solution. But, cast iron welds were generally considered risky propositions. So, Bowers turned to G. D. Peters and Company, Ltd. for their opinion.

Yes, indeed, Peters' men reported, it was possible to build up this gear. But, it called for careful control... and a high quality Nickel-cored electrode called Ni-Rod.

See below the step-by-step picture story of how this unusual job was done.

1 After degreasing in carbon-tetrachloride, and a thorough cleaning, the damaged teeth were ground down to offer a smooth surface for welding. Where teeth were broken off flush, holes were drilled in the rim and tapped. Studs were then inserted to lend extra support to the new teeth.

2 Before welding, the heavy cast gear was suspended over a temporary oven and heated with an oil torch to 600° F. This eliminated stresses and the possibility of cracking. The welding electrode used was ⅛" Ni-Rod at 95 amperes. After making one pass on one tooth, the gear would be given a quarter turn to assure even distribution of the welding heat.

3 This photo shows finished Ni-Rod "build-ups" on 6 of the teeth. To cut down machining time, tooth-size formers were used to enable the welder to gauge the depth of his deposit. These formers were of brass because Ni-Rod does not fuse with that metal.

4 After the gear had gradually cooled overnight in a low coke fire, the work of milling and machining began. Above illustration shows teeth being milled into Ni-Rod deposits. This work, says Bowers, proved to be easier than expected because the Ni-Rod deposits machined perfectly. Thus, instead of a 3 or 4 month lay-up, the excavator was back on the job in less than 2 weeks. *Reg. U. S. Pat. Off.

Ni-Rod comes in 3/32" to 3/16" diameters. Order a 5-lb. package and you'll agree it's the solution to any cast iron welding problem calling for strong, crack-free, machinable joints. *Write for free Ni-Rod instruct.on booklet.*

THE INTERNATIONAL NICKEL COMPANY, INC.
67 Wall Street, New York 5, N. Y.

EMBLEM OF SERVICE
INCO NI-ROD TRADE MARK

GET NI-ROD FROM:

Whitehead Metal Products Company, Inc.
Steel Sales Corp. — Williams and Company
Pacific Metals Company, Ltd. — J. M. Tull Metal & Supply Co.
Eagle Metals Co. — Metal Goods Corporation
Robert W. Bartram, Ltd. — Alloy Metal Sales, Ltd.
Wilkinson Company, Ltd. — Metal & Thermit Corporation
Hollup Corporation — National Cylinder Gas Company

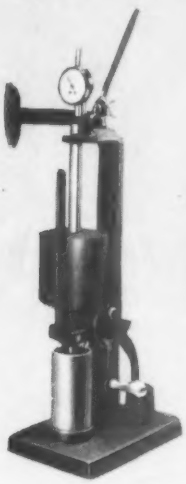
IF YOU WANT BETTER CASTINGS . . .

Control SAND-CORES-MOLDS

SAND

MOISTURE TELLER an instrument for either plant or laboratory which flash-dries sand samples for accurate moisture determination.

SAND RAMMER accurately reproduces the ramming of specimens to be tested for permeability, strength, density and flowability.



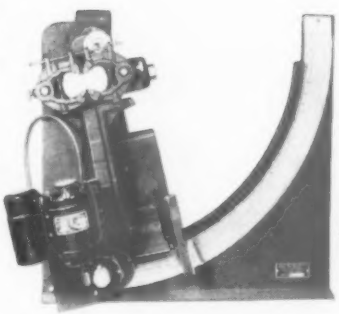
PERMMETER quickly and precisely determines the A.F.A. standard permeability of all molding materials. A direct reading unit.

SAND STRENGTH MACHINE determines green or dry compression and shear strength of sand—also deformation to determine plastic strength. It is either indicating or recording.

CORES

BAKING OVEN provides accurate control of core baking for core research and binder testing.

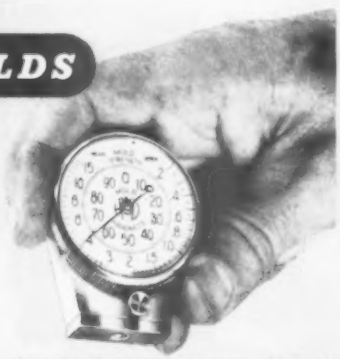
CORE PERMEABILITY TUBE is used with the Permmeter to determine the A.F.A. Permeability of baked cores and dried specimens.



TENSILE CORE STRENGTH ACCESSORY attached to the Sand Strength machine determines tensile strength of baked core specimens.

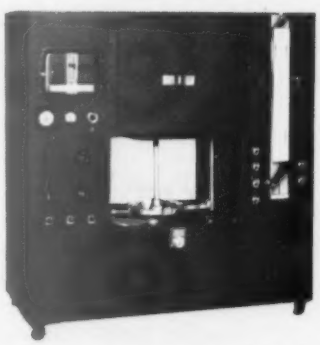
GAS DETERMINATOR measures volume of gas released by any core or molding sand mixture —used also to check baking practice.

MOLDS



MOLD HARDNESS TESTER determines hardness of green sand molds or green cores—also compressive strength of mold surface in psi.

CORE HARDNESS TESTER measures surface hardness of baked cores and dry sand molds.



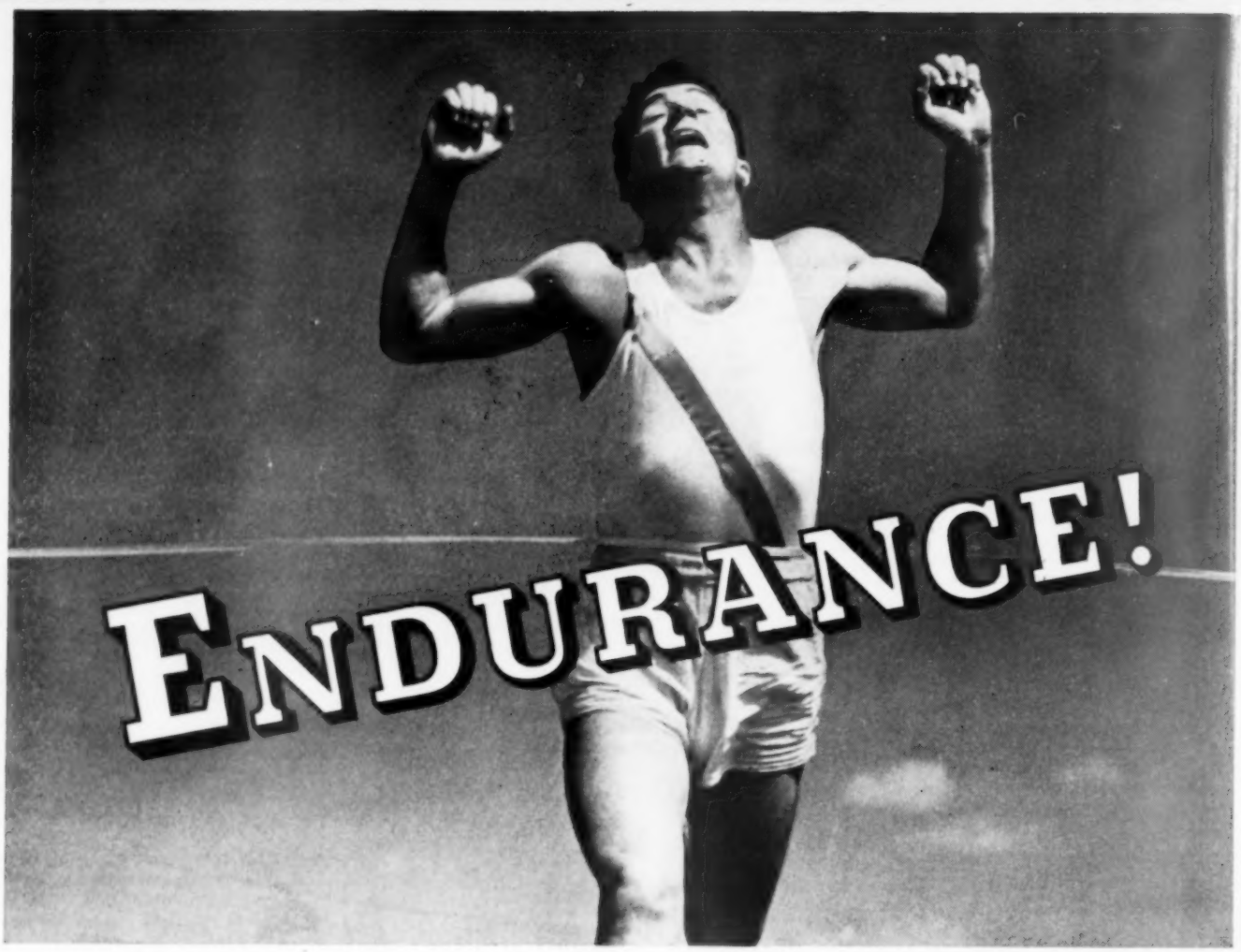
DILATOMETER: a complete high temperature testing laboratory. Predicts behavior of sand and core during pouring, solidification and shakeout.

2951

HARRY W. DIETERT CO.

9330 ROSELAWN AVE., DETROIT 4, MICHIGAN

SAND · MOLD · MOISTURE · SULFUR · CARBON



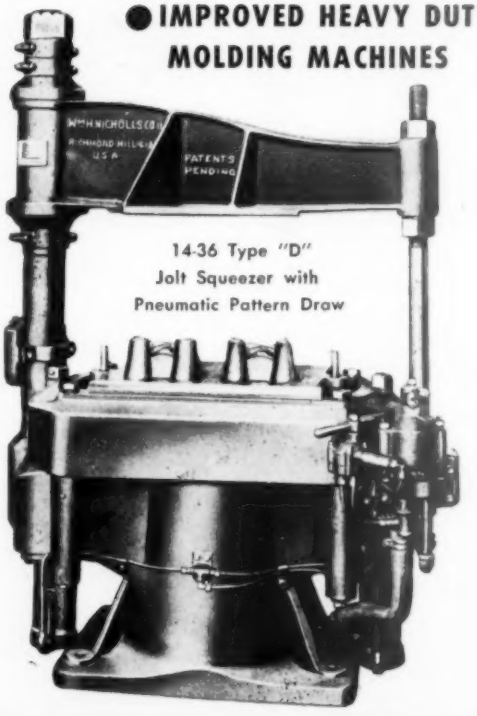
● ENDURANCE is the word for Nicholls Molding Machines. These machines turn out precise work in endless quantities. The exactness and continuous volume of good molds produced by Nicholls Molding Machines bring substantial savings to users. Nicholls has a complete line of stationary and portable types for the production of light, medium and heavy castings. Can be furnished with electric controls for push button operation.

Wm. H. NICHOLLS Co., Inc.
RICHMOND HILL 18, LONG ISLAND, NEW YORK

ESTABLISHED 1910

FOREIGN MANUFACTURERS AND SELLING AGENTS FOR CONTINENTAL EUROPE AND GREAT BRITAIN — GEORGE FISCHER, LTD., SCHAFFHAUSEN, SWITZERLAND

● **IMPROVED HEAVY DUTY MOLDING MACHINES**



14-36 Type "D"
Jolt Squeezer with
Pneumatic Pattern Draw

NICHOLLS

BOOSTS OUTPUT 67%

THE Rotor Application Engineer was asked by this midwestern fabricating shop to find ways of cutting grinding costs on jobs such as this one—grinding a hand hole with a plug wheel. A check of air pressure showed the *actual working pressure at the tool was only 60 lbs.,* whereas the line pressure was 95 lbs. The half-inch hose was too small and the quarter-inch nipples and hose menders took the punch out of the air flow. The Rotor Application Engineer recommended replacement with light, flexible ¾" Rotor hose and ½" nipples. Result:

Cut grinding time 40% by increasing working pressure at the tool to 85 lbs.

Call the Rotor Application Engineer for a similar check of your grinding costs. No obligation.

AIR O'TOOL

THE ROTOR TOOL CO.
CLEVELAND, OHIO
UNBIASED ANALYSIS OF PORTABLE TOOL PROBLEMS

LOOSE BARS ON THE JOB IN A HINES FLASK . . .

THE HINES
3431 WEST 140th ST.

LOOSE BARS?

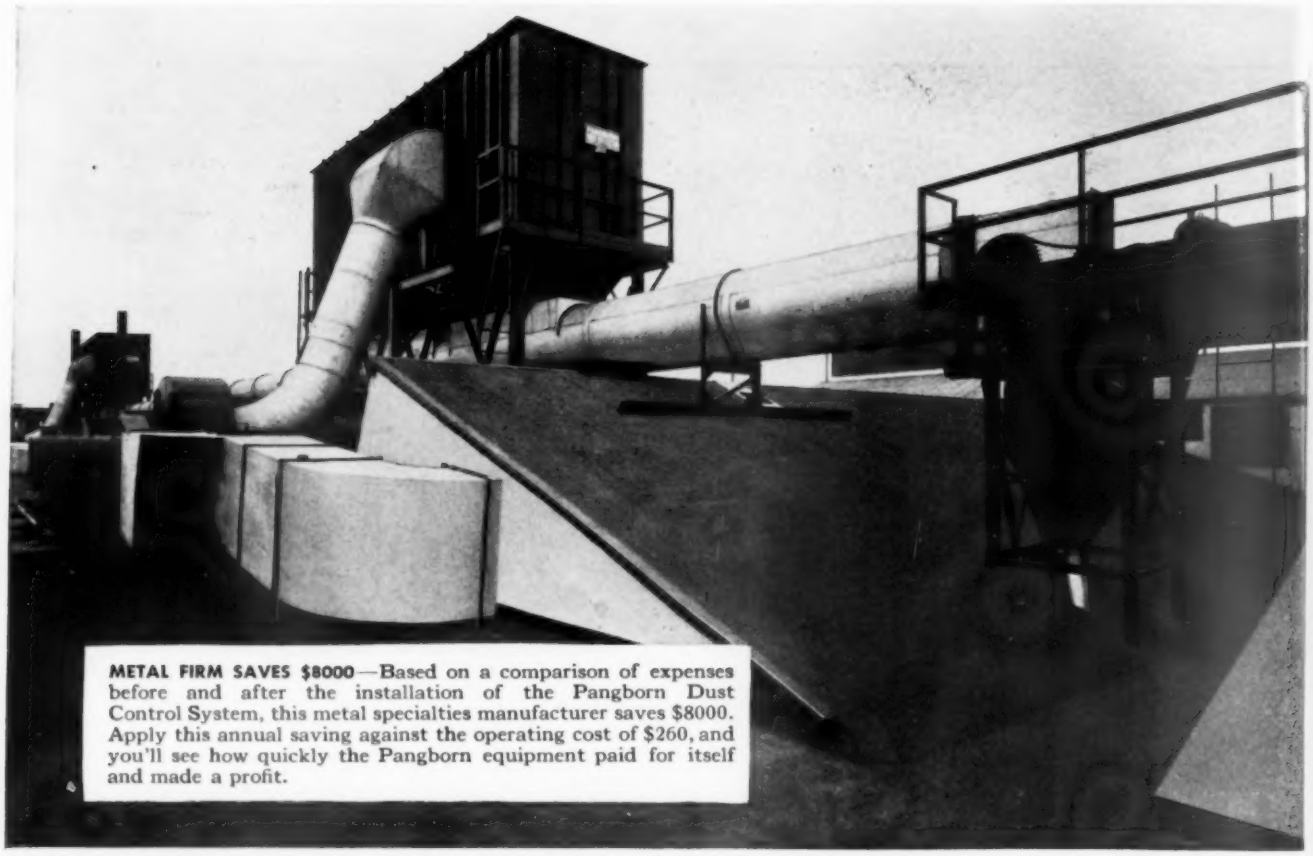
sure you can work 'em in all

HINES SLIP OR POP-OFF FLASKS

Ask Any of Our Sales Engineers for Details

SF FLASK CO.

CLEVELAND 11, OHIO

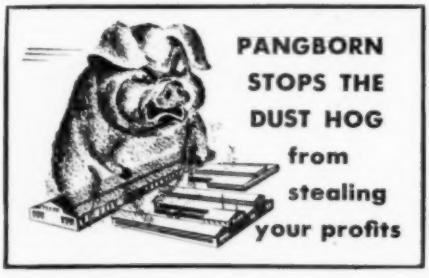


METAL FIRM SAVES $8000—Based on a comparison of expenses before and after the installation of the Pangborn Dust Control System, this metal specialties manufacturer saves $8000. Apply this annual saving against the operating cost of $260, and you'll see how quickly the Pangborn equipment paid for itself and made a profit.

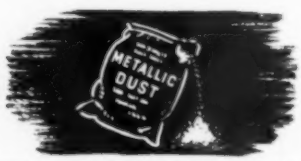
For These Manufacturers... PANGBORN turns Dust Losses into Dust Profits

YOU may look on industrial dust as a nuisance . . . but more probably you've found it to be an expensive liability. Pangborn Dust Control Equipment can help you decrease that dust loss liability, and in many cases, turn the tables and convert it to a new profit. At the left are several cases, taken from the hundreds of companies listed in the Pangborn customer file.

Whether your problem is to control dust to improve plant efficiency, recover by-products or increase product quality, Pangborn Dust Control Equipment can save you money, control an expensive liability. Write today for your *free* copy of "The Control of Industrial Dust." PANGBORN CORPORATION, 300 Pangborn Blvd., Hagerstown, Maryland.



Look to Pangborn for all the Latest Developments in Dust Control and Blast Cleaning Equipment.



METAL PLANT SALVAGES $5 DAILY!

This company salvages $5 worth of manganese dust per day with other savings of $1.50 per day. With low operating and maintenance costs, the Pangborn Dust Control System quickly paid for itself.

SALVAGES DUST FOR FUEL!

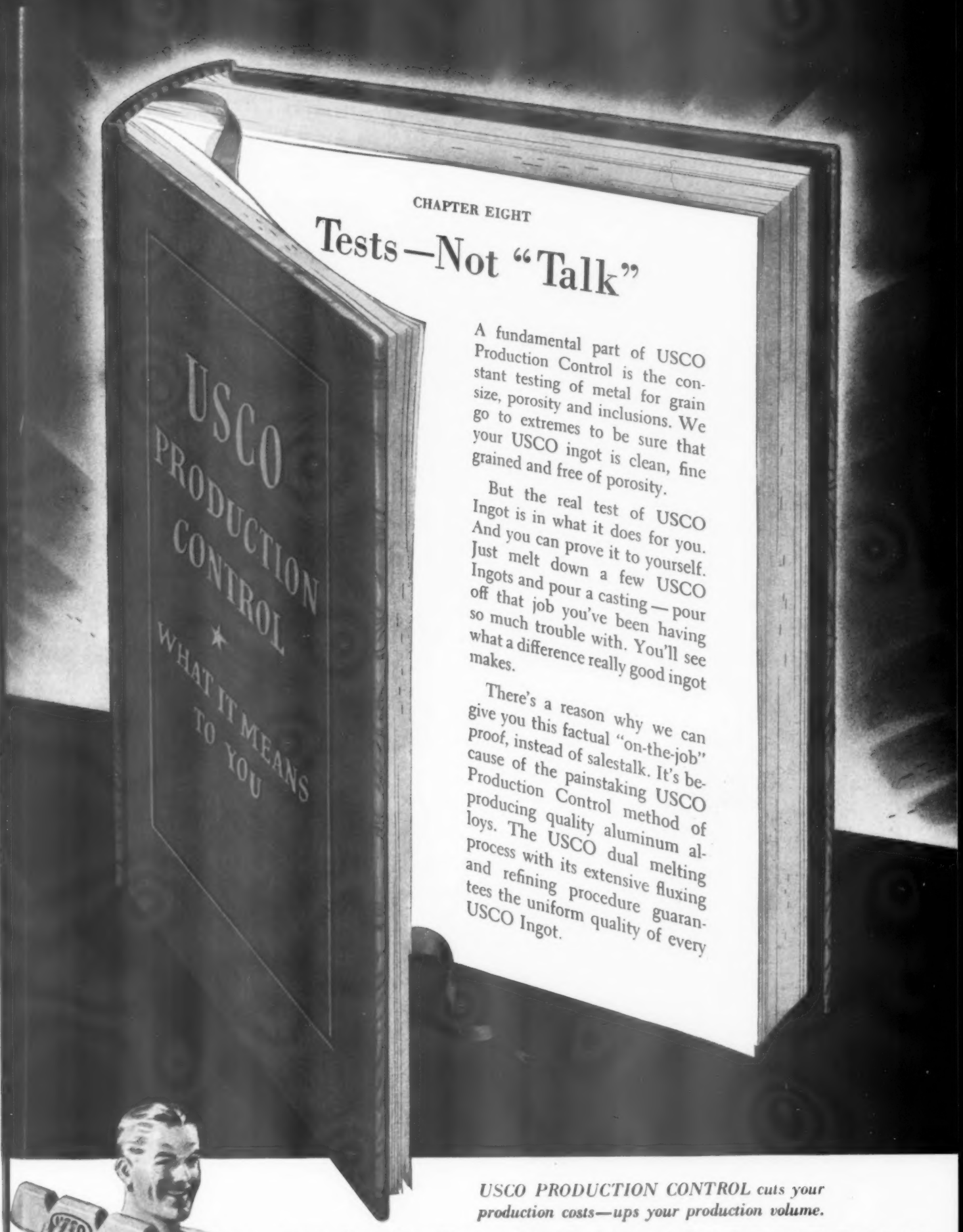
A musical instrument manufacturer salvages wood dust in his plant and burns it for fuel with an annual saving of $2500 on coal bills.

INCREASES QUALITY OF PRODUCT!

Soap manufacturer reports increase in product quality plus reduced plant maintenance. Salvage value of soap dust alone exceeds total operating and maintenance costs of Pangborn Dust Control System, thereby paying for equipment and making a profit.

Pangborn
DUST CONTROL

TURNS DUST LOSSES INTO PROFITS



CHAPTER EIGHT

Tests—Not "Talk"

A fundamental part of USCO Production Control is the constant testing of metal for grain size, porosity and inclusions. We go to extremes to be sure that your USCO ingot is clean, fine grained and free of porosity.

But the real test of USCO Ingot is in what it does for you. And you can prove it to yourself. Just melt down a few USCO Ingots and pour a casting — pour off that job you've been having so much trouble with. You'll see what a difference really good ingot makes.

There's a reason why we can give you this factual "on-the-job" proof, instead of salestalk. It's because of the painstaking USCO Production Control method of producing quality aluminum alloys. The USCO dual melting process with its extensive fluxing and refining procedure guarantees the uniform quality of every USCO Ingot.

USCO PRODUCTION CONTROL cuts your production costs—ups your production volume.

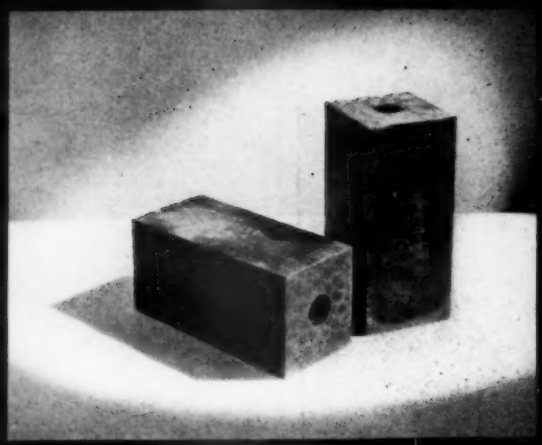
USCO ALUMINUM

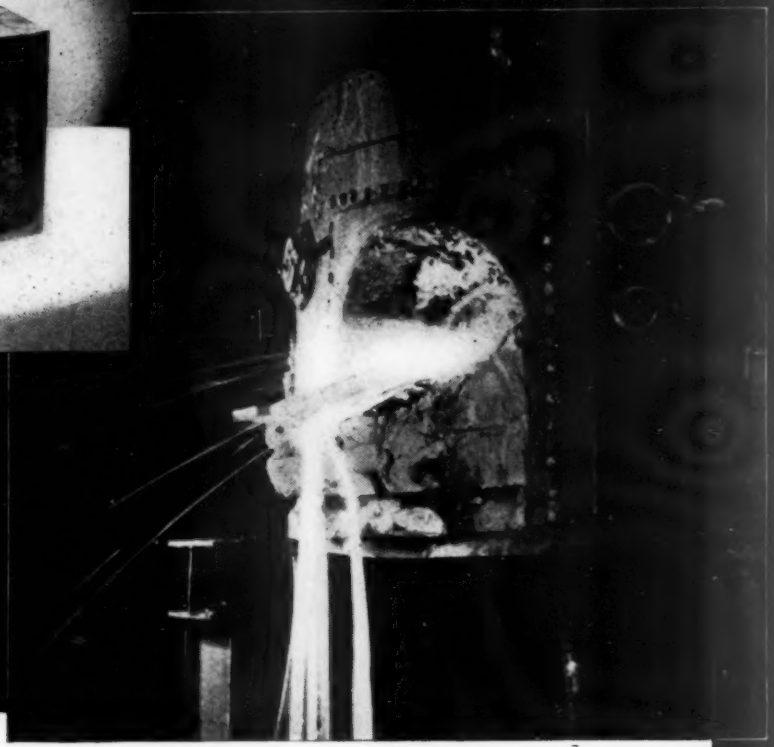
Pioneer Producers of Quality Aluminum Ingot

U. S. REDUCTION CO. *East Chicago, Ind.*

CRYSTOLON Slag Hole Blocks

Pay Their Way in the Foundry





CRYSTOLON slag hole blocks, made by Norton Company of densely bonded silicon carbide grain, give long trouble-free service in foundry cupolas. The hard, dense surface of these chemically inert blocks is resistant both to the abrasion and penetration of molten slag.

CRYSTOLON blocks resist all slag action either by corrosion or erosion. Consequently the hole size is maintained for a longer period of time, giving better control of the flow. These rugged slag hole blocks are highly refractory and will neither soften nor spall at temperatures up to 1650°C.

NORTON REFRACTORIES LIKE HEAT

NORTON COMPANY • WORCESTER 6, MASS.

Controls Cupola

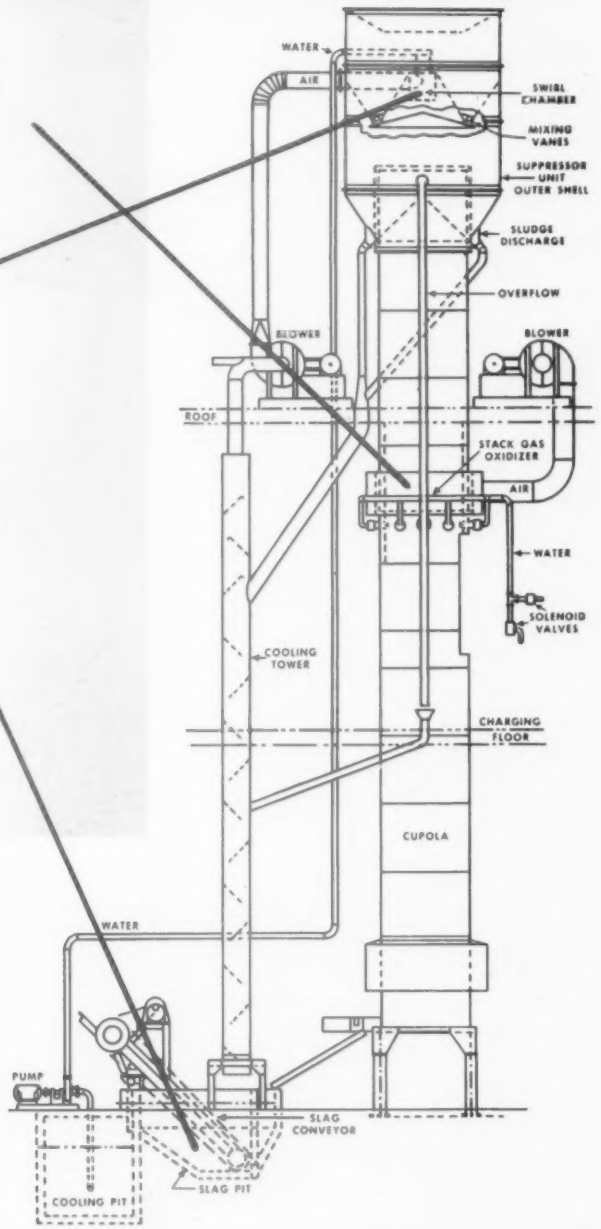
Fly Ash and Sparks

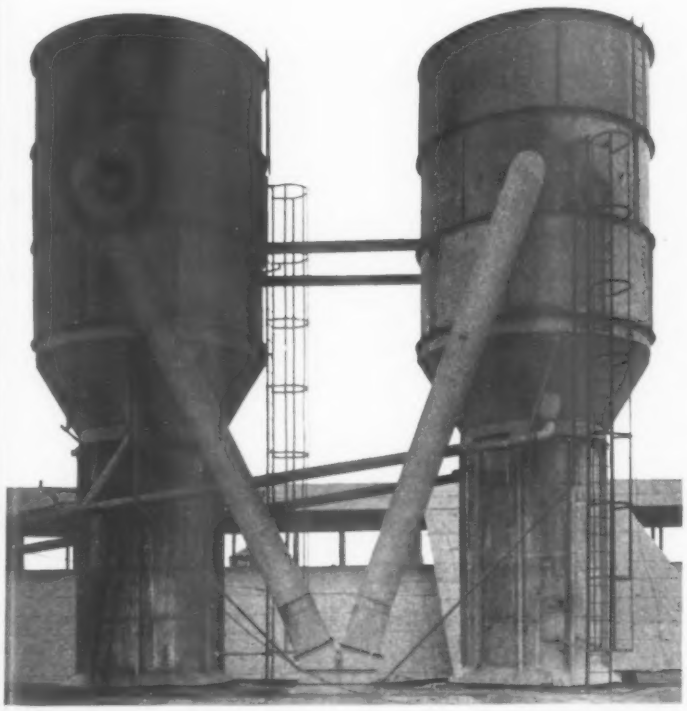
The Hydro-Clone Dust and Spark Suppressor injects atomized water and air into rising stack gases, which creates a secondary combustion zone . . . then cools the gases.

Unburned solids are arrested in wet suppressor and converted to harmless sludge.

Sludge is carried to slag pit for automatic removal . . . or into a manual sludge tank if preferred. The water is recirculated.

New Bulletin FY-152 describes this equipment in detail. Write for a free copy—no obligation.





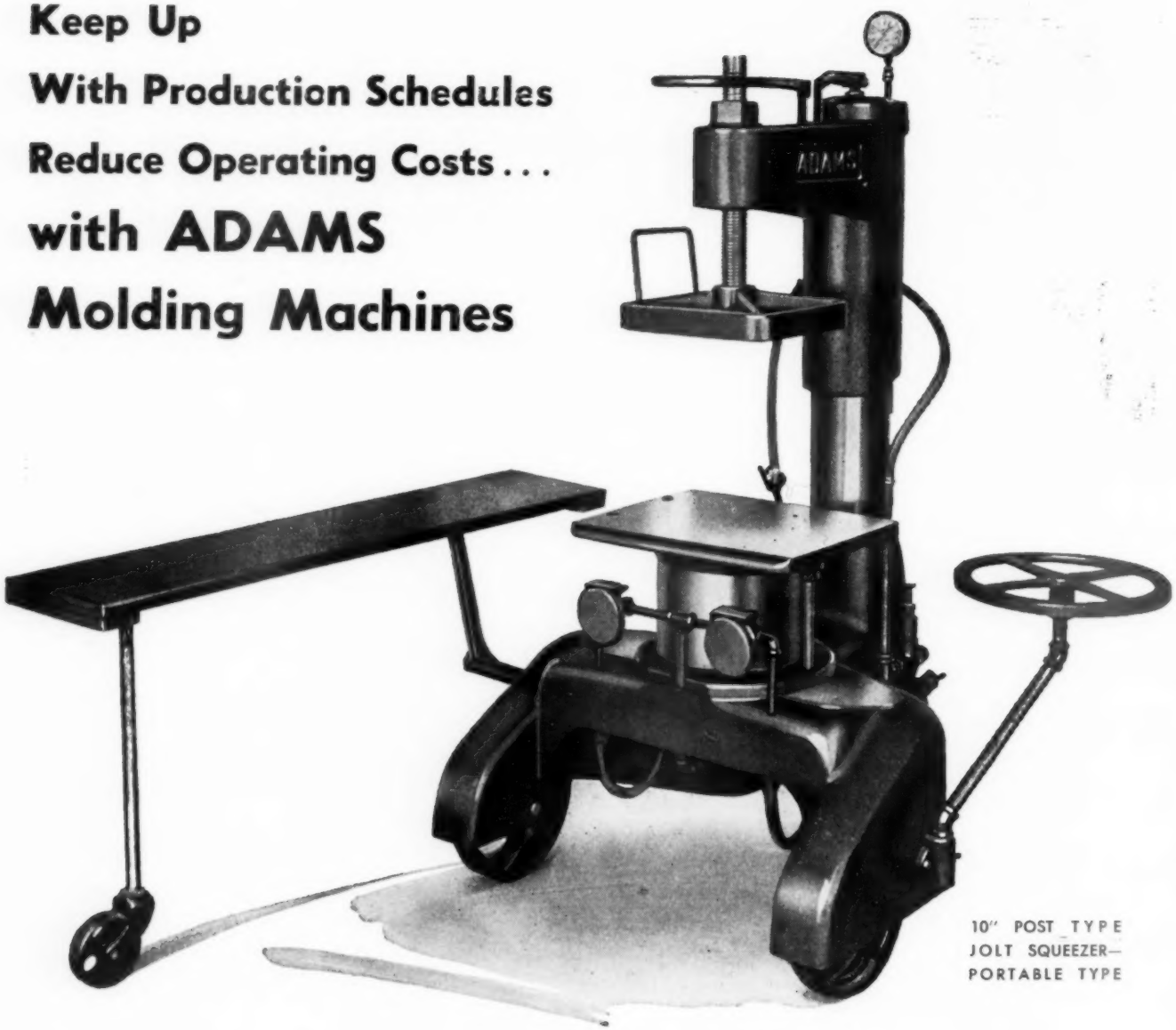
Two #12 Whiting Hydro-Clone Dust and Spark Suppressors

WHITING
CORPORATION

15607 Lathrop Ave., Harvey, Illinois

Offices in Chicago, Cincinnati, Detroit, Los Angeles, New York, Philadelphia, Pittsburgh, and St. Louis. Agents in other principal cities. Canadian Subsidiary: Whiting Corporation (Canada) Ltd., Toronto, Ontario. Export Department: 30 Church St., New York 7, N. Y.

Keep Up
With Production Schedules
Reduce Operating Costs . . .
with ADAMS
Molding Machines



10" POST TYPE
JOLT SQUEEZER—
PORTABLE TYPE

All-out production—You'll get just that with Adams fast, accurate molding machines—and at lower costs! Their speed, stamina and power, plus simplified design for easy operation, help maintain steady, high output levels even with unskilled labor. Losses are limited by the close control of jolting and squeezing operations which assure accurate, uniform molds.

Here are some of the features that lower production costs—Minimum working parts, protected against sand and dust—convenient, accessible operating controls for quick handling—great flexibility—low maintenance costs. Adams molding machines give dependable, long term service. They stand up to the pressures of high production, maintaining their efficiency and accuracy throughout prolonged hard use.

SIZES AND TYPES FOR ANY SQUEEZE MOLDING REQUIREMENTS

Side Rod Type and Post Type—Jolt Squeeze and Jolt-Squeeze-Pattern-Draw-Styles—Stationary and Portable-Hand Squeezers. Write today for full details in Catalog No. 705. THE ADAMS COMPANY, 700 Foster St., Dubuque, Iowa.

The ADAMS Company

ESTABLISHED 1883

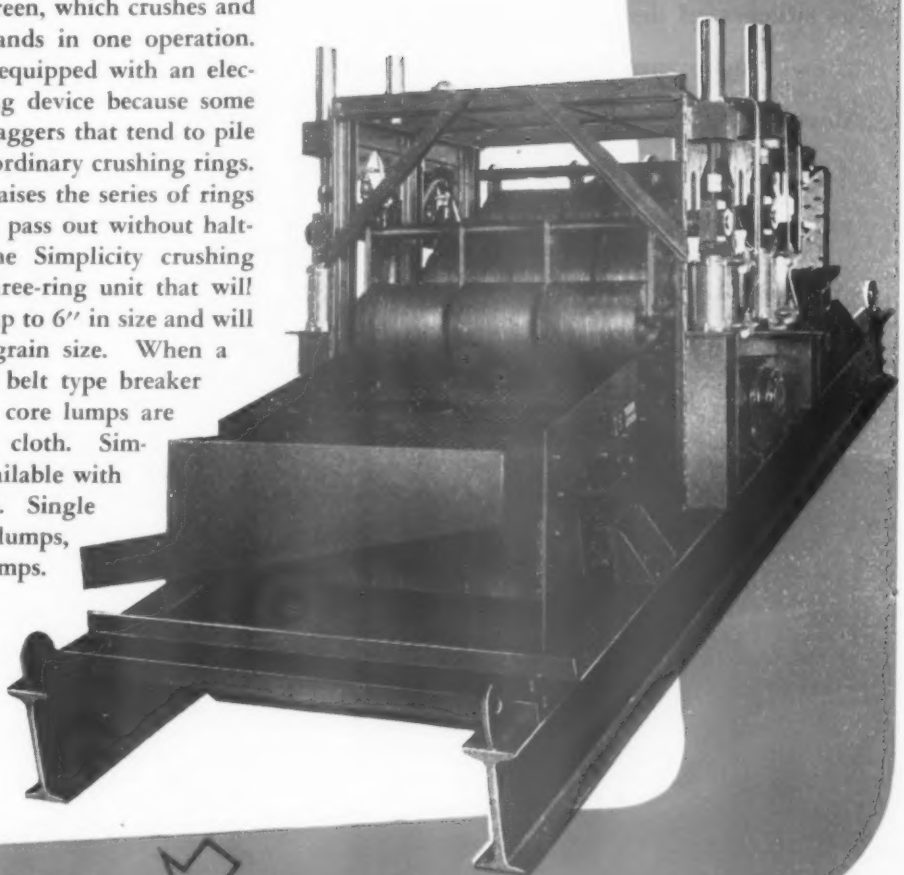
DUBUQUE, IOWA, U.S.A.

MOLDING MACHINES and FLASK EQUIPMENT

Making Double Duty Pay

Simplicity Ring Type Crushing Screens Combine Two Operations Effectively

One of the most popular Simplicity foundry units is the Ring Type Crushing Screen, which crushes and screens moulding and core sands in one operation. This rugged machine can be equipped with an electrically timed automatic lifting device because some sands contain bent rods and gaggers that tend to pile up so they do not pass under ordinary crushing rings. The automatic lifting device raises the series of rings to permit the accumulation to pass out without halting machine operations. The Simplicity crushing screen illustrated here is a three-ring unit that will take a feed containing lumps up to 6″ in size and will reduce 75% of the load to grain size. When a lower deck with a Simplicity belt type breaker is added, 90% of the hardest core lumps are reduced to pass a 1/8″ screen cloth. Simplicity crushing screens are available with one, two or three sets of rings. Single rings take up to two-inch lumps, double ring up to four-inch lumps.



Simplicity
TRADE MARK REGISTERED

ENGINEERING CO. • DURAND, MICHIGAN

- SALES REPRESENTATIVES IN ALL PARTS OF U.S.A. • FOR CANADA:
- CANADIAN BRIDGE ENGINEERING CO., LTD., WALKERVILLE, ONTARIO.
- FOR EXPORT: BROWN & SITES, 50 CHURCH ST., NEW YORK 7

CONTROLLED QUALITY

UNITED STATES ELECTRICAL TOOLS

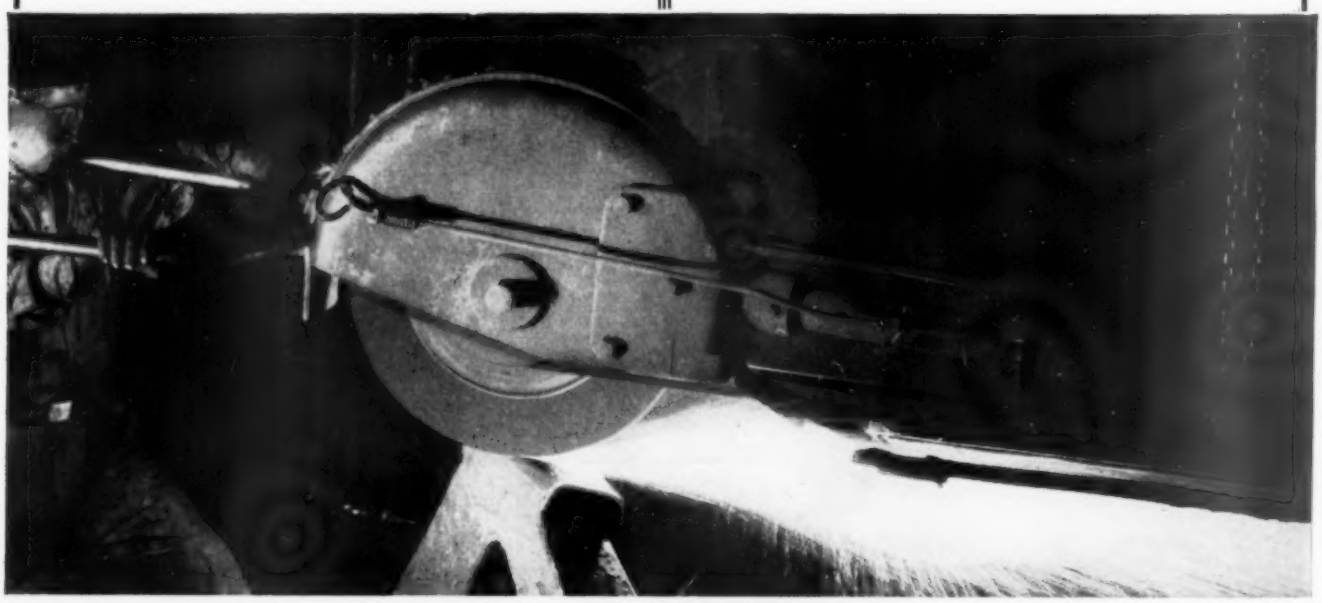
are modern exponents of quality thinking and quality operation based on experiences which cover more than a half-century. As pioneers in invention and production, as constant innovators, as successful designers and engineers of these important factors in industrial development, United States Electrical Tools bring you these practical, efficient aids to production and maintenance.

AMERICA'S MOST COMPLETE LINE OF ELECTRICAL TOOLS CARRIED IN STOCK BY YOUR LEADING JOBBERS

SWING FRAME GRINDER

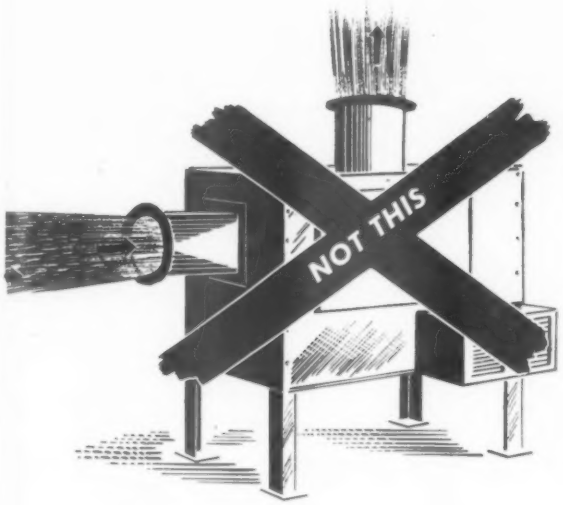
Perfect Balance, Perfect Visibility, Perfect Performance

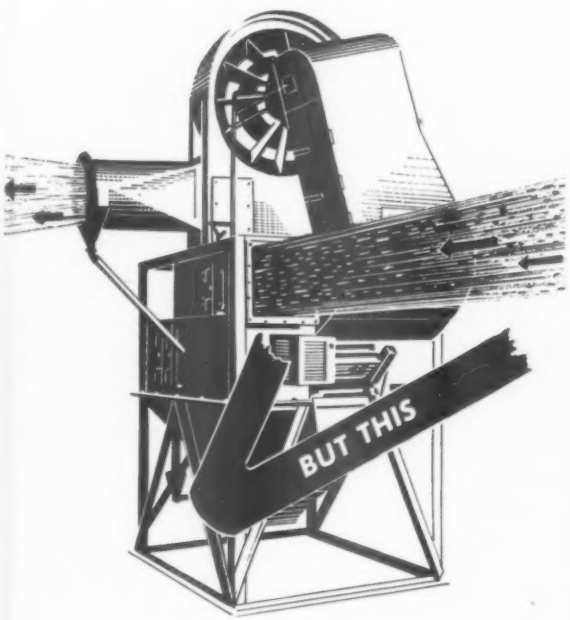
Any angle from 45° right to 80° left; anti-friction bearings throughout; 2-speed V-belt drive; for 16″, 20″ and 24″ high speed wheels; guards of boilerplate steel; wheels changed easily and quickly; ball-bearing totally enclosed fan-cooled motor; single suspension at center; double suspension at wheel head and motor head.



The UNITED STATES ELECTRICAL TOOL *Co.*
CINCINNATI, OHIO

Why use water in a dust collector?





Roto-Clone's high collection efficiency gives you the answer

WHEN dust particles are brought into intimate contact with water, the weight of the particles is increased so even small micron sizes can be removed from an air stream by centrifugal and dynamical forces. The combination of these forces and the proper utilization of water in the collecting function of a dust collector assures—

1. Constant air delivery.
2. Dust free disposal.
3. Small space requirement.
4. Freedom from maintenance.
5. High efficiency regardless of temperatures or presence of moisture vapor or steam.

Do you want to do a complete job of dust control right down to the collection of extreme fines—the kind of job that reduces plant maintenance and eliminates community problems? If so, either the Type W or Type N Roto-Clone* is your logical choice—as both utilize water for highest collection efficiency.

The Type W combines water sprays with dynamic precipitation to impinge and trap the dust particles. The Type N operates by the hydrostatic principle which cleans the air by a combination of centrifugal force and intimate intermixing of water and dust laden air.

For complete information on Roto-Clone dust control, call your local AAF representative or write direct for Bulletin No. 270-A.

*Roto-Clone is the trade-mark (Reg. U. S. Pat. Off.) of the American Air Filter Company, Inc., for various dust collectors of the dynamic precipitator and hydrostatic precipitator types.

AMERICAN AIR FILTER COMPANY, INC.
266 Central Avenue, Louisville 8, Ky.
In Canada: Darling Bros., Ltd., Montreal, P. Q.

AAF
ROTO-CLONE®
DUST CONTROL EQUIPMENT

This Emblem means something to you, too

Membership in Gray Iron Founders' Society, Inc., is an indication of progressiveness. In one of America's great basic industries, the 600 members of the Society represent upwards of 75 per cent of the total output.

Objectives of the Society are aimed at benefiting all users of Gray Iron components, as well as the member companies making these indispensable products for industry.

A long-range program of research, self-improvement and expansion has been launched by the Society, with these basic aims:

1. Assistance to users and potential users of Gray Iron in making their products better, in lowering their costs, or both.

2. Consultation and service to help members improve their products and their processes.

3. Education—within the membership, in technical schools and throughout industry as a whole—on the uses and characteristics of Gray Iron components.

GRAY IRONS PROVIDE THESE USEFUL PROPERTIES:

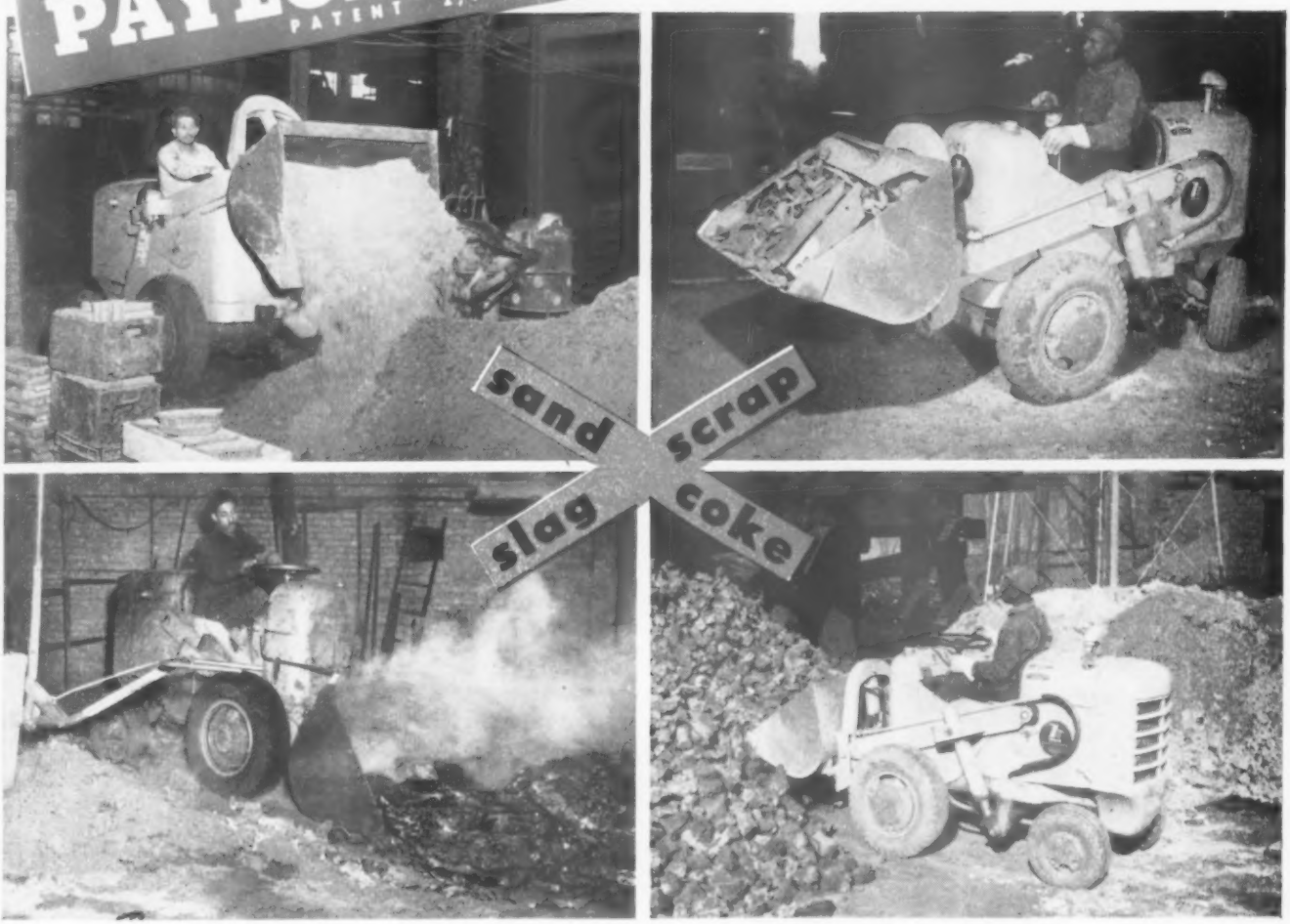
1. Machinability
2. Damping capacity
3. Heat resistance
4. Rigidity
5. Low notch sensitivity
6. Durability
7. Castability—dimensional accuracy
8. Wide selection of mechanical properties
9. Abrasion and wear resistance
10. Corrosion resistance

"Make It Better With Gray Iron"

GRAY IRON FOUNDERS' SOCIETY, INC. 33 PUBLIC SQUARE CLEVELAND 13, OHIO

HOUGH
SAY "HUFF"
PAYLOADER
PATENT 2,412,323

a workhorse on wheels!



Save Time, Money, Man Hours... Boost Production

Hundreds of foundries have installed Hough Payloaders and found them one *sure* way to lick rising costs, solve manpower shortages and increase tonnage. A Payloader is a workhorse on wheels . . . actually pays for itself within a few months by the savings in time and manhours and increased production which result. Typical of Payloader performance is the case of a Model HA, 10½ cu. ft. size, that saved 5,000 hours of labor in the first four months of operation at a Midwestern foundry. Speedily twisting, turning and traveling, Payloaders go in and out of box cars and bins, up and down ramps, through narrow doorways and aisles . . . unload, load, transport and dump sand, slag, scrap, castings, coke and other bulk materials. They do quickly and easily many material handling tasks that are now slow, laborious and costly.

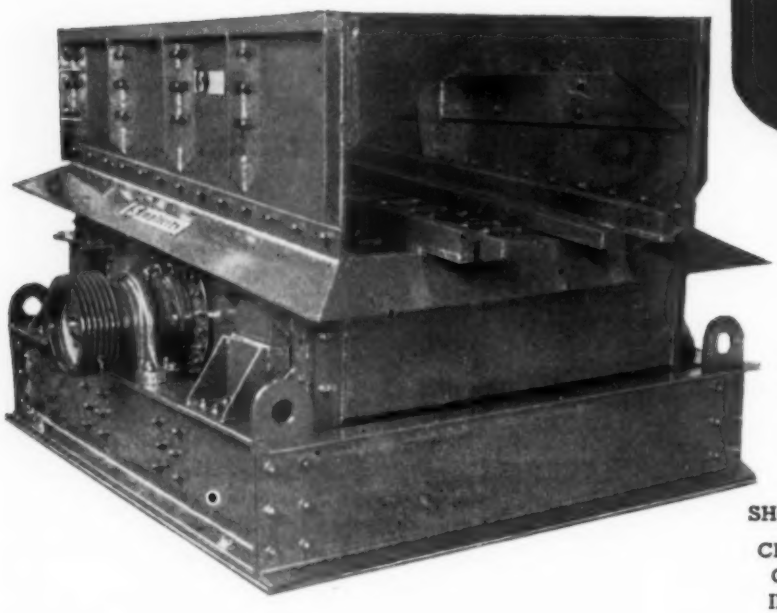
It will pay you to investigate the advantages of Payloaders for your own foundry. Write today for literature and the name of the Hough distributor near you who sells and services these modern material-handling miracle workers.

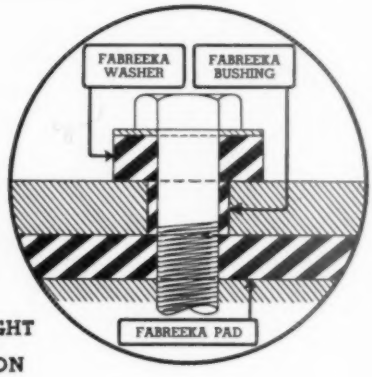
SEND TODAY for literature on the Model HA 10½ cu. ft. Payloader, the ¾ yd. Model HF and the 1¼ yd. Model HL.

THE FRANK G. HOUGH CO.
703 SUNNYSIDE AVENUE, LIBERTYVILLE, ILLINOIS
TRACTOR SHOVELS SINCE 1920

for IMPACT SHOCK and VIBRATION

Under Shakeout Machines





SHOWN AT RIGHT
CROSS SECTION OF FABREEKA INSTALLATION

FABREEKA

Reduces Maintenance and Increases Production

FABREEKA Pads, bushings, and washers are installed under Jolt Moulders, Shakeout Machines, Tumbling Barrels and other heavy machinery to reduce the effects of heavy impact shocks and destructive vibration.

FABREEKA has demonstrated its ability to prevent breakage of machine parts and to keep bolts tight, thereby reducing maintenance and increasing production.

It Pays to Specify Fabreeka

In addition to these important advantages, Fabreeka has long life, which makes its final cost a low cost.

Write for latest literature

FABREEKA PRODUCTS COMPANY INCORPORATED
222B SUMMER STREET BOSTON 10, MASSACHUSETTS

"THE WHEELS OF Sterling INDUSTRY"
These portables Give extra service and Take the punishment of this type of grinding
There is an important "give and take" to Sterling Vitrified and Resinoid Portable Grinding Wheels. They give many extra hours of grinding, and take less out of the workman while doing it!
Available in a wide variety of shapes and sizes, these "Wheels of Industry" grind welds, quickly remove gates and risers from castings, and do a better than usual job on all types of steel and castiron. Sterling's two popular specifications—KA146 P6 BPC for steel and C146 P7 BFC for castiron — are available from stock to solve your production problems, speedily and thoroughly!
For an easy-handling, cooler-running wheel, you cannot do better than specify STERLING every time! Our engineers will gladly cooperate!
Literature, describing these wheels and listing various specifications and applications, will be sent upon request.
• STERLING ABRASIVES •
THE STERLING GRINDING WHEEL DIVISION
OF THE CLEVELAND QUARRIES COMPANY
TIFFIN, OHIO
THE WHEELS OF INDUSTRY

There's little you CAN'T do . . .

with this Tabor cope and drag pair

TRUE—they can't help the coke shortage—or collect a slow account—but here's what they *can* do:

IN THE PRODUCTION SHOP

The Jar, Power Rollover, Power Draw machine will complete its cycle of operations in 35 seconds or less. And that's counting the time to deliver the mold to a hydraulic device which cushions it down to desired conveyor level.

With working access from three sides, the Jar, Flask Lift machine is an equally speedy mate. Together, they keep cope and drag production in near-perfect balance.

IN THE JOBBING SHOP

Both machines put high-production features into short-run work. The new plate design on the Rollover machine is a Tabor innovation. It permits *independent* setting of all four clamps—speeds changeover where pattern shifts are frequent.

Adjustable lift pins make the Jar Flask Lift equally versatile. They're quickly set for a wide range of flask lengths and widths.

Both machines are furnished either plain or shockless jar—stationary or portable (up to 1000# capacity). Both have the faultless Tabor air-on-oil draw. And, traditional with Tabor, both give long life at low up-keep.

You can do this, too!

You can modernize your present Tabor Jar, Power Rollover, Power Draw machine—step up both its speed and flexibility. Install in it the new quick-changeover table for *independent* setting of all four clamps and the hydraulic flask-lowering device for quick clearance of finished work. Easily done when your machine capacity is within the range of 600 to 3000 pounds.

REPRESENTATIVES
Snyder Foundry Supply Company, Los Angeles, California; Snow & Galgiani, 533 Second St., San Francisco 7, Calif.; Carl F. Miller & Company, Seattle, Washington; M. W. Warren Coke Company, 1017 Olive St., St. Louis 1, Mo.; E. R. Frost Company, Inc., Minneapolis 14, Minn.

The TABOR Manufacturing Co.

SINCE 1884 MANUFACTURERS OF FOUNDRY MOLDING MACHINES
6225 TACONY STREET • PHILADELPHIA 35, PENNA.

save labor . . .

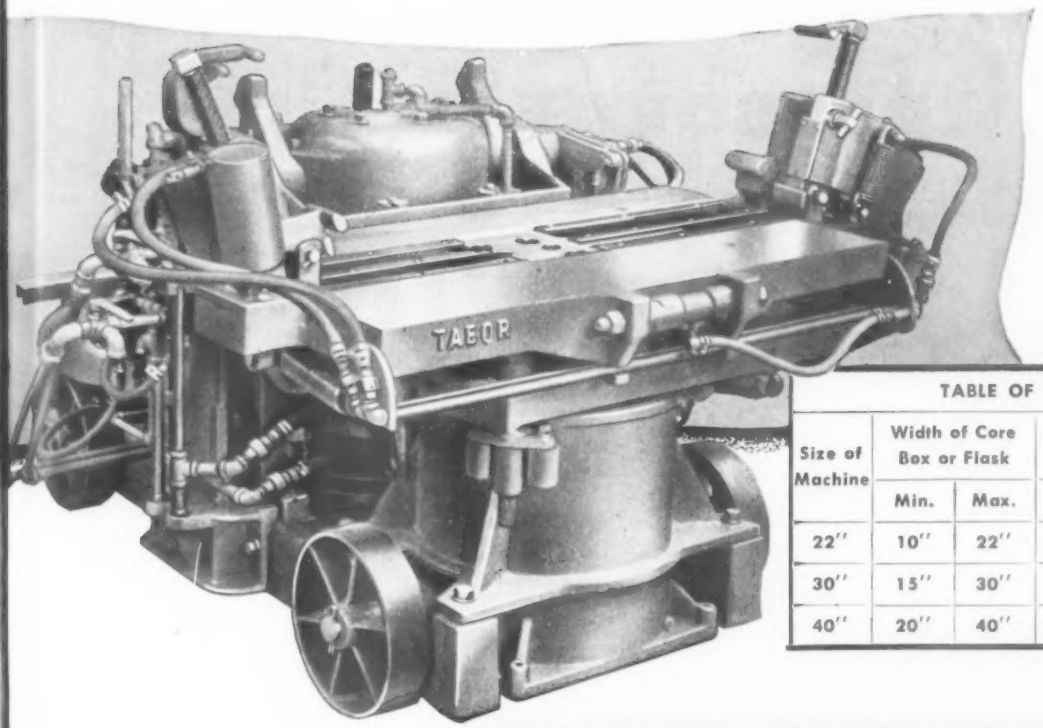
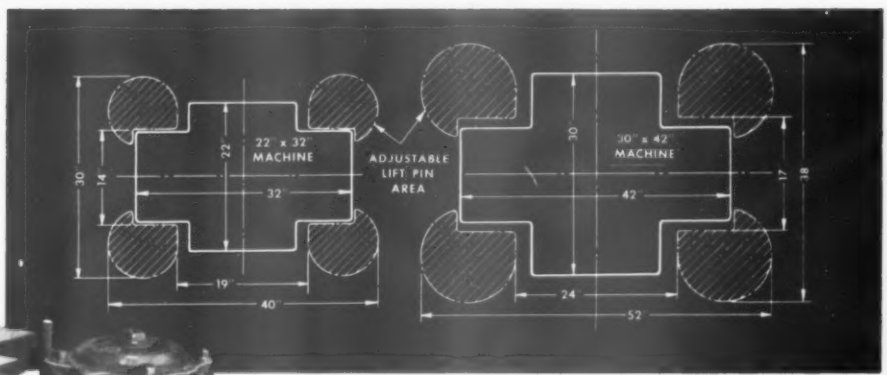
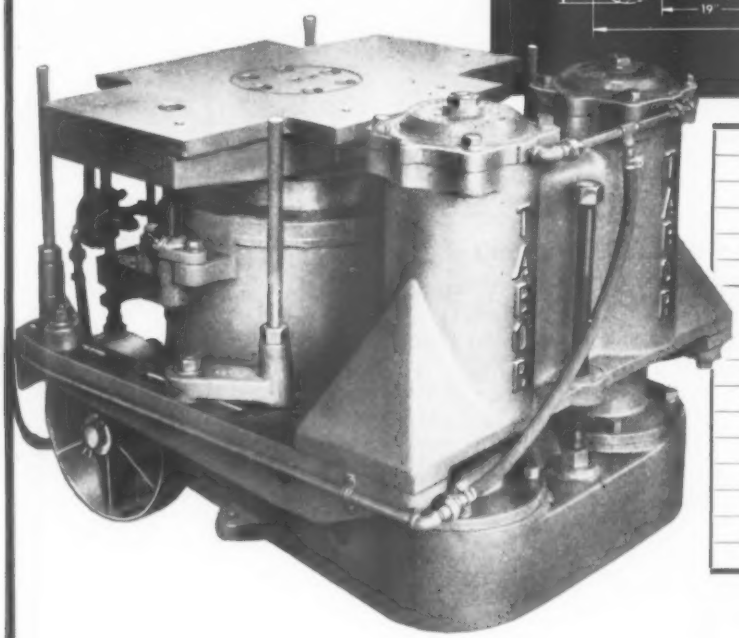


TABLE OF STANDARD SIZES						
Size of Machine	Width of Core Box or Flask		Length of Core Box or Flask		Height—Including core plate	
	Min.	Max.	Min.	Max.	Min.	Max.
22"	10"	22"	20"	40"	7½"	14"
30"	15"	30"	26"	46"	8"	18"
40"	20"	40"	28"	56"	12"	25"

*Also available with squeeze head.





Size of Machine	22" x 32"*	30" x 42"
Table Size	22" x 32"	30" x 42"
Capacity—80# Air	600#	1000#
Patt. Draw.—Plain Jar	10"	12"
Patt. Draw.—Shockless	9"	12"
Lift Pin Adjustment	See cut	See cut
Max. Width Flask with Center of Flask on Center of Jar Mach.	30"	38"
Min. Width Flask	14"	17"
Max. Length of Flask	Unlimited within capacity of machine	
Patt. Draw.	Oil Controlled—Slow & Fast	
Height Table from Floor—Portable	28"	32"
" " " " —Stationary	26"	30½"
Portable Mach. 3 Wheels	12" Dia. 3" Face 14" Dia. 4" Face	
Stationary Mach.	3 Foundation Bolts	
Weight Shockless Jar	2600#	4000#
Weight Plain Jar	1900#	2700#

. . . buy Tabor

MANUFACTURER'S ASSOCIATION, INC. FOUNDRY EQUIPMENT

ROSSBOROUGH

Nonferrous Fluxes

SPECIALISTS IN NONFERROUS FLUXES FOR 16 YEARS

BRASS AND BRONZE FLUX— A neutral flux with low melting point which protects your metal during the melting process and keeps furnace and crucibles clean without attacking the linings.

ALUMINUM FLUX— An all purpose aluminum flux designed to deoxidize, de-gas and increase recovery from skimmings at a lower temperature.

ALUMINUM BOILING FLUX— A special aluminum flux for preventing shrinks and misruns in permanent mold and thin section sand castings.

ALUMINUM SMELTING FLUX— A powerful flux for use on all scrap materials. Reacts at a low temperature increasing metal recovery. Recommended for smelting use or for remelting of gates, borings and scrap.

Ask Our Jobbers for Rossborough "Aluminum Ladle and Furnace Coat" and "Permanent Mold Spray."

COMPLETELY STOCKED JOBBERS

Boston, Mass.	Malcolm G. Stevens Co., 78 Summer St., Arlington, Mass.
Brooklyn, N. Y.	New York Sand & Facing Co., 106-114 Grand Ave.
Chattanooga, Tenn.	Manufacturers Equip. & Supply Co., 1200 Fort St.
Chicago, Ill.	Foundry Supplies Co., 461 West 33rd Street
Cleveland, Ohio	Hoffman Foundry Supply, 1193 Main Ave.
Dayton, Ohio	Fenton Foundry Supply Co., 134 Gilbert Street
Detroit, Michigan	Wolverine Foundry Supply Co., 3211 Bellevue Ave.
Indianapolis, Ind.	John M. Glass Co., 18 S. New Jersey St.
Philadelphia, Pa.	George F. Pettinos Co., 1206 Locust St.
St. Louis, Mo.	M. W. Warren Coke Co., 1017 Olive St.
Los Angeles, Calif.	Independent Foundry Supply, 2325 E. 38th Street

ROSSBOROUGH SUPPLY COMPANY

1457 WEST NINTH ST. CLEVELAND, OHIO

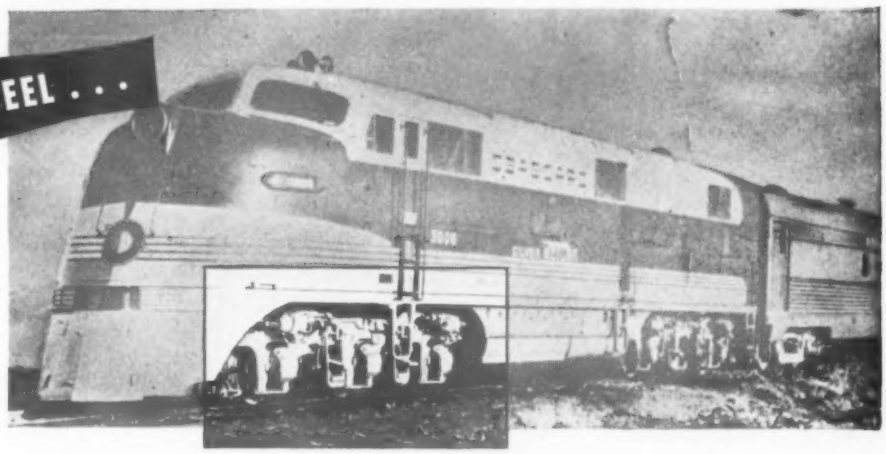
"ELECTROMET" VANADIUM

Trade-Mark

FOR THE PRODUCTION OF FINE STEELS

VANADIUM GIVES STEEL . . .

- ★ HIGH STRENGTH
- ★ INCREASED DUCTILITY
- ★ GOOD WELDABILITY
- ★ ABRASION RESISTANCE
- ★ TOUGHNESS



Springs, axles, and other parts of the trucks of high-speed diesel locomotives are made of vanadium steel. Vanadium is also used in steel for tools and machinery parts because of the exceptional properties that it imparts.

Vanadium improves steel by increasing its yield strength and its ductility. Vanadium-bearing steels are tough—because of their uniformly fine grain size – and resist abrasion, fatigue, and impact. They are especially suitable for parts subject to high dynamic stress.

Vanadium steels are readily cast, forged, and rolled. They are also easily machined, and have exceptional weldability. When vanadium is added to steel in quantities ranging from 0.05 to 0.20%, heat-treatment is simplified. Its use results in a tough, strong, wear-resisting surface on case-carburized parts.

ELECTROMET ferrovanadium is made especially for the manufacture of fine steels for tools and machinery parts. This ELECTROMET alloy contains 50 to 55% vanadium and is available for immediate delivery in grades containing maximum 0.20%, 0.50%, or 3.00% carbon. It is furnished in various crushed sizes suitable for all open-hearth and electric-furnace additions.

Our staff of competent metallurgists is always ready to furnish on-the-job technical assistance in the use of vanadium and other ELECTROMET ferro-alloys and alloying metals. Write to the nearest ELECTROMET office.

ELECTRO METALLURGICAL SALES CORPORATION

Unit of Union Carbide and Carbon Corporation

30 East 42nd Street UCC New York 17, N. Y.

OFFICES: Birmingham • Chicago • Cleveland • Detroit
New York • Pittsburgh • San Francisco

In Canada: Electro Metallurgical Company of Canada, Limited, Welland, Ontario.

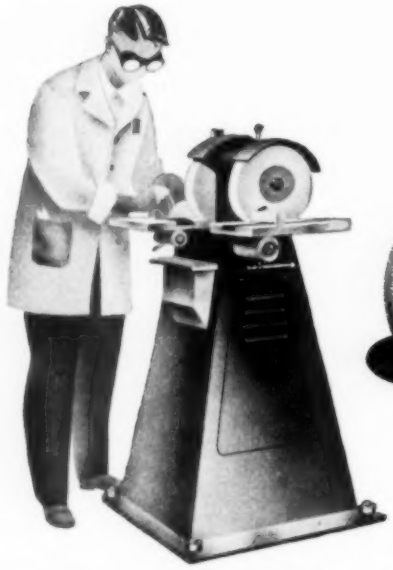
Electromet

TRADE-MARK

Ferro-Alloys and Metals

A BUYING GUIDE FOR ABRASIVES

ABRASIVE PROBLEM:
How can Selection and Application be simplified?



ANSWER BY
CARBORUNDUM
TRADE MARK

Through an extensive program, The Carborundum Company is making selection and application of the best abrasives to use for specific jobs simpler and more efficient. "Series 20" is a timely example. In a relatively narrow pattern of grits and grades, these wheels cover a wide range of grinding operations. The smaller number and variety of wheels that need be stocked is only one of several important benefits realized.

Easier to specify and order, products by CARBORUNDUM, repackaged and relabelled for fast identification, explain another reason for their growing preference by users of abrasive products. The Carborundum Company, Niagara Falls, New York.

A Good Rule for Good Grinding...CALL IN

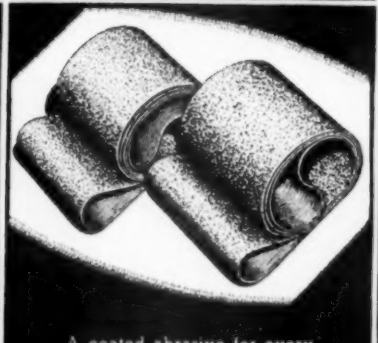
CARBORUNDUM
TRADE MARK

- BONDED ABRASIVES
- COATED ABRASIVES
- ABRASIVE GRAINS AND FINISHING COMPOUNDS

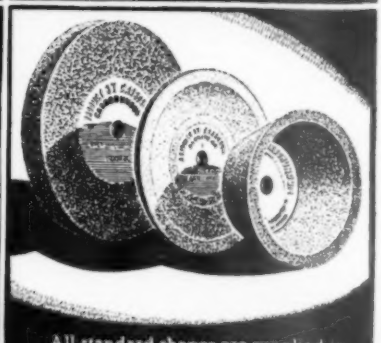
Specialized wheels by CARBORUNDUM for thread grinding.

Diamond wheels to meet stiffer technical needs.

Cool-cutting GREEN GRIT wheels for cemented carbide



A coated abrasive for every sanding and finishing condition.



All standard shapes are supplied in grinding wheels by CARBORUNDUM

"Carborundum" is a registered trademark which indicates manufacture by The Carborundum Company.

it's NEW

it's MORE COMFORTABLE

it's RUGGED

Heavy Duty Glove

AO 5X264

Feel it, test it, wear it and you'll see why this latest addition to the AO steel stapled line is ideal for handling small castings, rough stock, grinding and similar work.

Made of specially treated chrome tanned cowhide leather for long wear, the glove features a canvas back with elastic strap to overcome hand fatigue while providing a cooler feeling and snug fit.

All seams are steel sewed and the seam along the forefinger has been eliminated for longer glove life and added comfort at this vulnerable point.

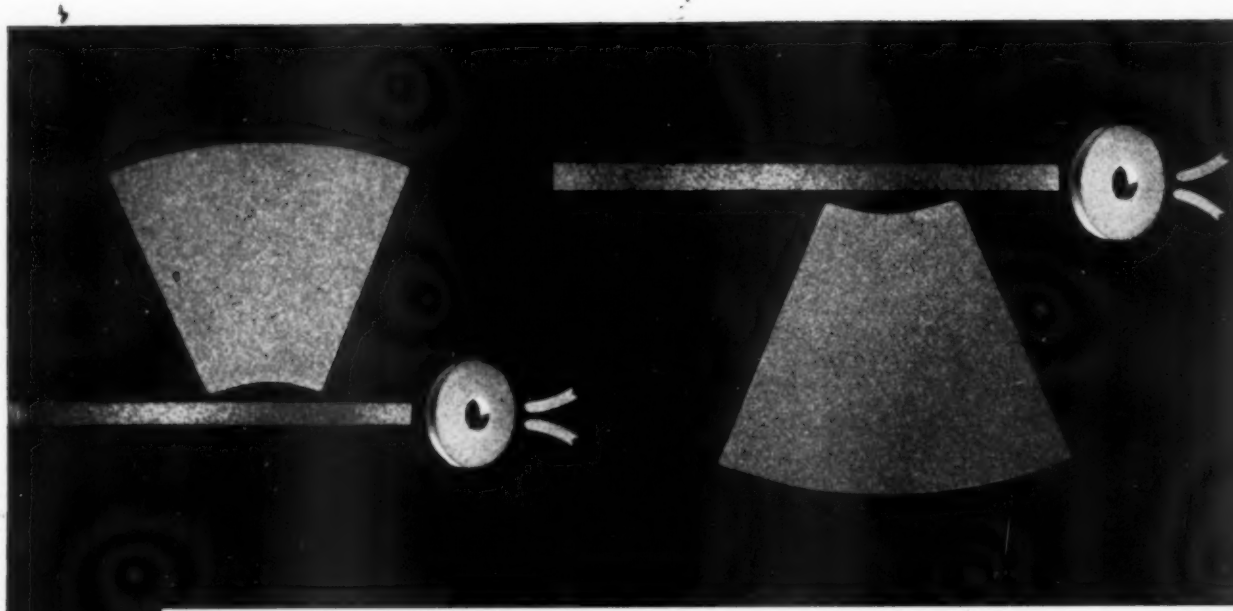
Wearing surface of the palm has also been increased by extending the palm — no bib patch — another comfort feature.

The steel stapled strap at the thumb crotch fortifies one of the weakest parts of a glove. There is a steel stapled patch on face of thumb and a short cufflex cuff with tape binding.

You'll lower your glove costs with the 5X264 — ask your AO Safety Representative or inquire at your nearest AO Branch Office.

American Optical COMPANY *Safety Division*

SOUTHBRIDGE, MASSACHUSETTS • BRANCHES IN PRINCIPAL CITIES



How to duck high grinding costs

Are you certain that you're not paying higher grinding costs than necessary? There's a sure way to duck that extra expense.

Not by buying cheaper wheels—that's always more expensive in the long run.

No, the best way to drop your grinding expense is to get the *right* wheels for each grinding job . . . wheels that give you greater stock removal, better finishes, need less dressing, and last longer.

This calls for a careful examination of your grinding needs *before you buy;* the exhaustive kind of examination Peninsular is prepared to conduct for you, in your own grinding department.

Before recommending any wheels, Peninsular engineers analyze everything about your grinding operations: your machines, your methods, the materials you grind and the finishes you need.

If anything can cut your grinding costs, it's greater *efficiency*. And if anything can bring you greater efficiency, it's this exhaustive Peninsular examination, and wheel recommendations based on the *facts* it brings out.

When may a Peninsular engineer call on you?

The Peninsular Grinding Wheel Co., 729 Meldrum Avenue, Detroit 7, Michigan. *Sales Offices:* Chicago, Philadelphia, Buffalo, Cleveland, Pittsburgh, Houston, St. Louis, Cincinnati.

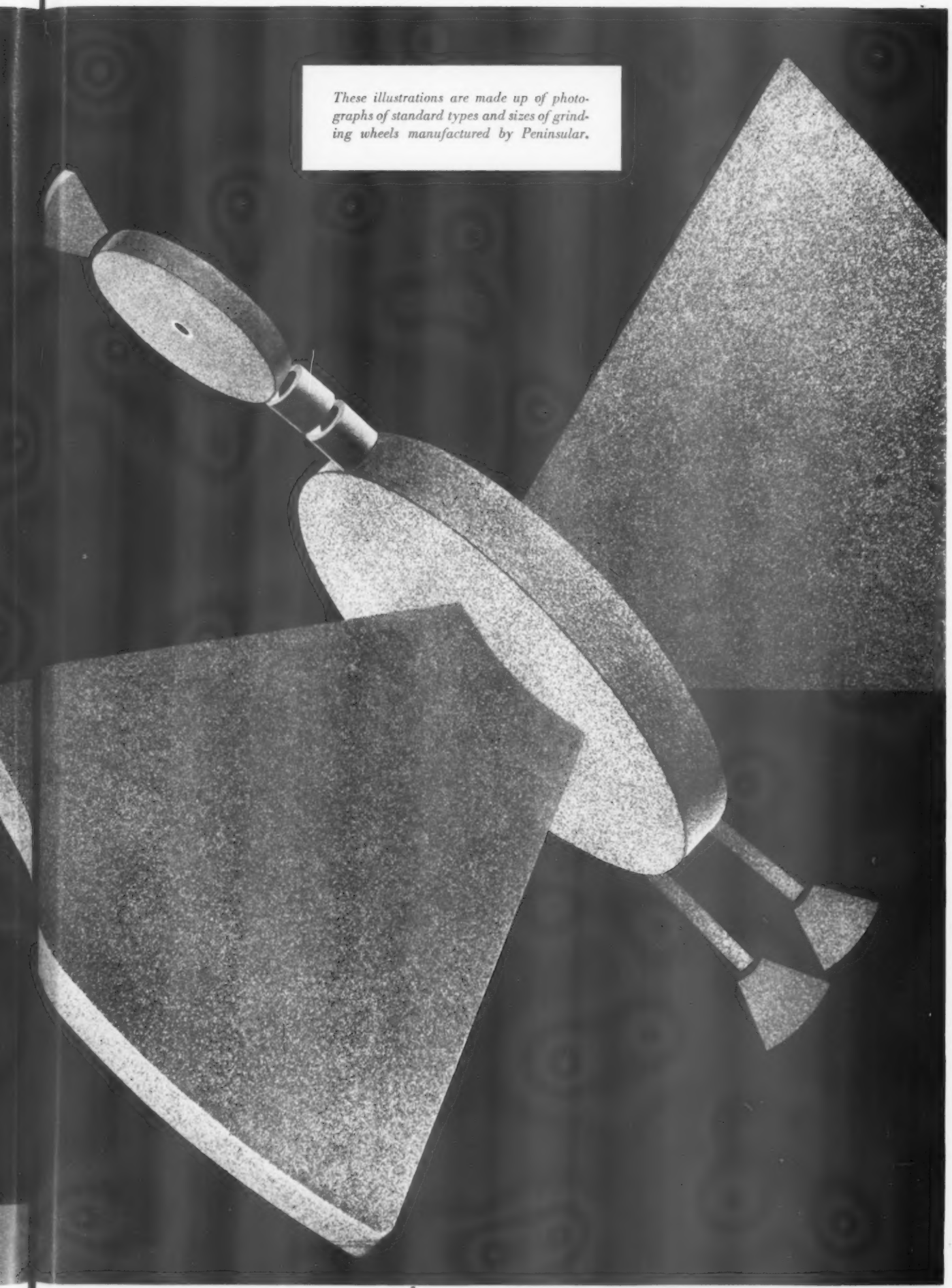
PENINSULAR

INDIVIDUALLY PENINSULAR *ENGINEERED*

GRINDING WHEELS

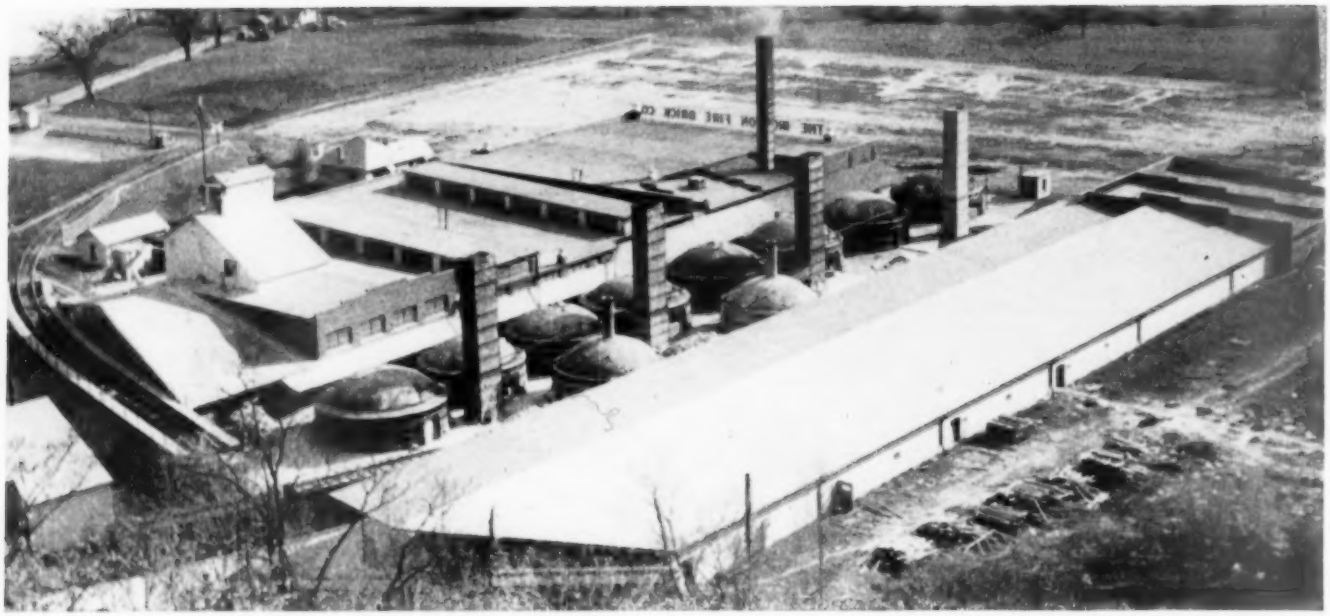
SINCE 1889

SPECIALISTS IN RESINOID BONDED WHEELS



These illustrations are made up of photographs of standard types and sizes of grinding wheels manufactured by Peninsular.

REFRACTORIES



BUILT TO SERVE YOU

This company seeks every opportunity to be of full service to the foundry industry. As a pioneer in the manufacture of machine made cupola blocks, we enabled many foundrymen to secure longer service from their cupola linings.

We developed a special type of plastic ramming refractory called "Ironton Nojoint" for lining desulphurizing ladles.

"Ironton Caro-Line", siliceous ramming refractory is widely used in electric steel foundries for ladle linings, acid electric furnace bottoms, and monolithic sidewalls and in side blow converters.

"Ironton Berlite" is doing an outstanding service job in gray iron foundries. Ask us for data on all these products.

THE IRONTON FIRE BRICK COMPANY

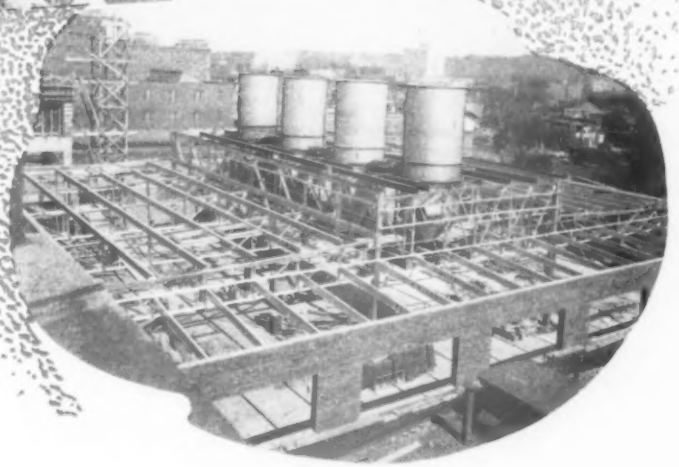
RELIABLE REFRACTORIES

IRONTON OHIO

· BUILDING A NEW FOUNDRY
· BUILDING AN ADDITION
· REMODELING ?

Include a SCHNEIBLE MULTI-WASH SYSTEM IN THE SPECIFICATIONS . . . .

There are substantial savings effected by installing Schneible Multi-Wash Dust Collectors while a foundry is being erected, because (1) structural steelwork can be properly designed without the use of extra steel supports, (2) installation can be made at the time the building steel is placed by the contractor without need for calling in a second contractor with extra rigging, (3) where units are installed through or on the roof there is no need for cutting, fitting or flashing and (4) where a large system is involved (as in installation shown) it is much easier to move the sections to the site and erect them without interference from walls, equipment or workers.



THE ULTIMATE of SIMPLICITY IN DUST CONTROL

The Schneible Multi-Walsh System washes foundry air continuously removing dust and fumes, converting them into innocuous sludge. The sludge is dewatered periodically, disposed of easily, and the wash water used over and over. No other system is so quiet, effective, attention-free, inexpensive to operate. Send for Bulletin 47-Schneible in the Foundry Industry.

SCHNEIBLE --- AMERICA'S NO. 1 ENEMY OF DUST AND FUMES

CLAUDE B. SCHNEIBLE CO.
2827 Twenty-Fifth St., Detroit 16, Mich.
Engineering Representatives in Principal Cities

SCHNEIBLE

LIQUID-VAPOR INTIMATE CONTACT EQUIPMENT for DUST COLLECTION ABSORPTION CONDENSATION AND TEMPERATURE REDUCTION

COLEMAN TOWER* OVENS

for BETTER CORES, SMOOTHER CASTINGS, LOWER COSTS

says **R. A. BLYWISE,**
Executive Vice President
The Republic Brass Company
Division of Briggs Mfg. Co.

"Our Coleman Tower Core Oven has proven itself a most satisfactory and self-amortizing investment since it was installed about two years ago. Our core department can now easily supply our mechanized foundry with all core requirements.

"You will be interested to know that we are getting a much more uniformly baked core which reflects itself in the fact that we are getting smoother castings and a reduction of our scrap casting loss. In addition, our core department personnel like the installation as our new oven has eliminated smoke and fume nuisance completely."

PATENTED OPEN CENTER: Provides close, efficient grouping of coremakers around the oven. The exclusive 3-way loading feature increases accessibility 300% over ordinary vertical oven designs. Cuts carry time... increases productivity.

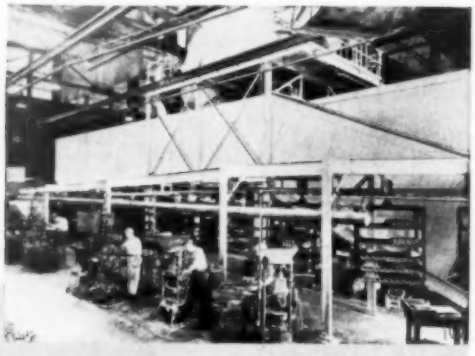
AMAZING FLOOR SAVING: The elimination of racks, aisleways, and large working space required by batch ovens permits savings up to 75% in floor area. Less space... greater output.

RECUPERATIVE COOLING SYSTEM: Cores are "smoked off" and cooled before they reach the unloading station, making for better working conditions. The heat recovered from the cores is used over again, resulting in large fuel savings.

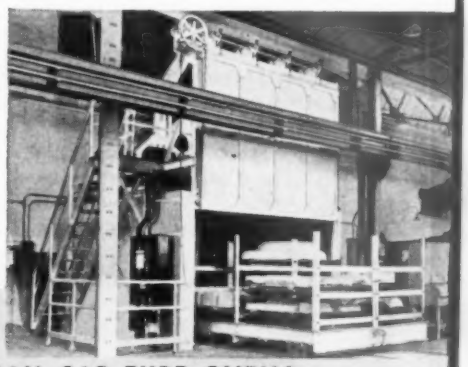
PERFECT BAKING: Eliminates rejects and make-overs. Coleman Heating Systems for gas, oil or stoker-coal; whichever fuel is most economical in your locality.

COLEMAN TOWER OVENS ARE BUILT IN A WIDE RANGE OF SIZES AND CAPACITIES

*Trade Mark Reg. U. S. Pat. Off.



COLEMAN HORIZONTAL CORE OVENS
Overhead conveyor ovens specially designed for large scale production foundries in such fields as agricultural, automotive, etc.

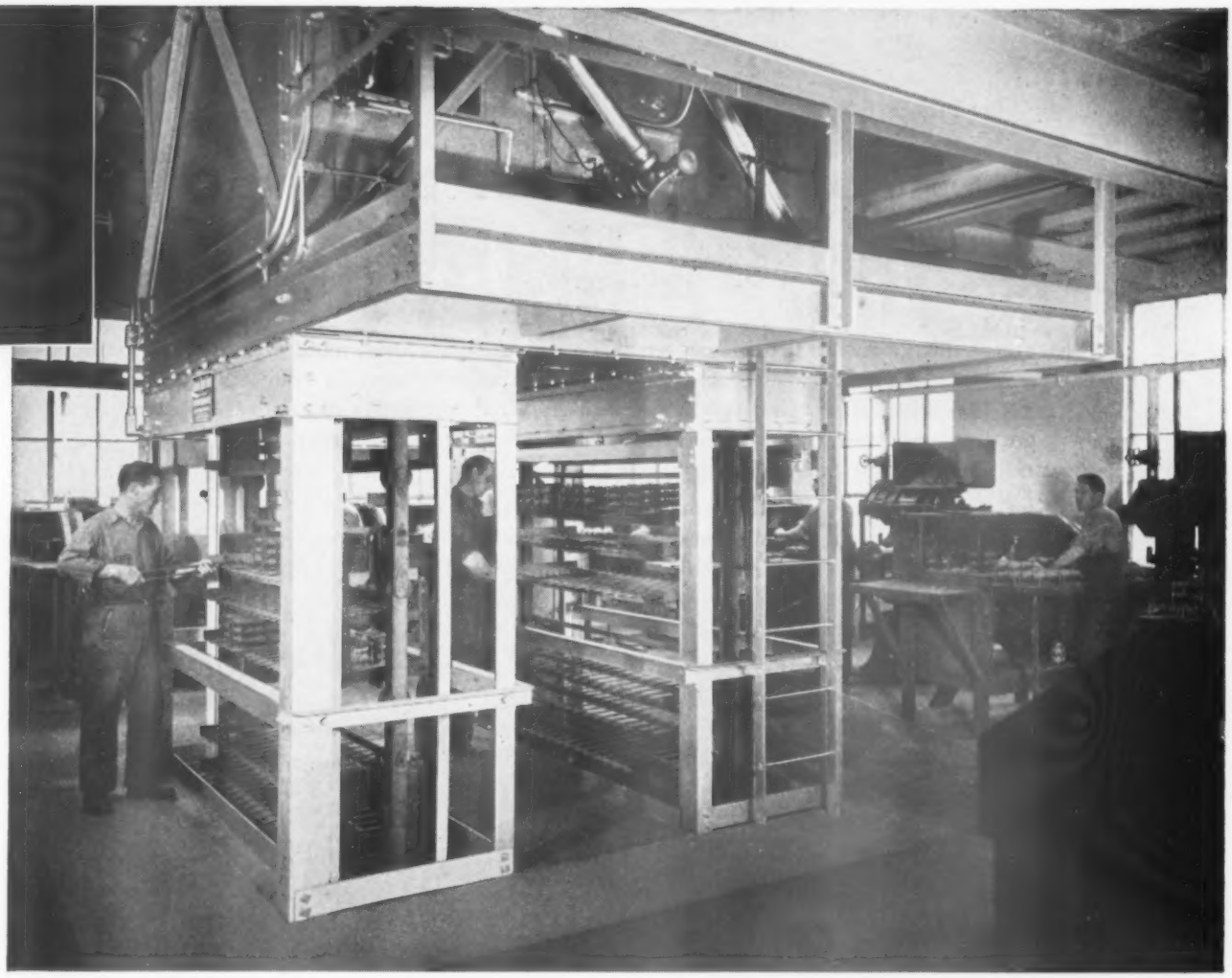


COLEMAN CAR-TYPE OVENS
For baking large cores or drying molds. Coleman Car-Type Ovens are used by most of the leading producers of heavy castings.

The FOUNDRY EQUIPMENT CO.

CLEVELAND 13, OHIO, U. S. A.

WORLD'S OLDEST AND LARGEST FOUNDRY OVEN SPECIALISTS



Coleman Tower Oven at The Republic Brass Company, Division of Briggs Mfg. Co., Cleveland, Ohio

★ **COLEMAN TRANSRACK OVENS**

For use with portable racks to reduce handling labor. Very efficient where ample floor space is available.

OTHER MANUFACTURERS OF CAST BRASS PRODUCTS USING COLEMAN TOWER OVENS:

American Radiator & Standard Sanitary Corp.
Barnes Manufacturing Co.
Central Brass Mfg. Co.
A. Y. McDonald Mfg. Co.
Empire Brass Mfg. Co., Ltd.
Scovill Manufacturing Co.
Sully Brass Foundry, Div. Neptune Meters Ltd.
Schaible Company
Ohio Brass Company
Wolverine Brass Works
Walworth Company
Josam Products Foundry Co.
Chapman Valve Mfg. Co.
Johnson Bronze Company, Inc.
W. D. Allen Manufacturing Co.

COLEMAN TOWER OVENS ARE USED EXTENSIVELY IN LEADING FOUNDRIES PRODUCING GRAY IRON, MALLEABLE, STEEL, ALUMINUM AND MAGNESIUM CASTINGS.

WRITE TODAY FOR BULLETIN 48

COMPANY

BUILDERS OF COLEMAN AND SWARTWOUT OVENS

MEMBER MANUFACTURER'S ASSOCIATION, INC. FOUNDRY EQUIPMENT

COLEMAN
CORE AND MOLD OVENS

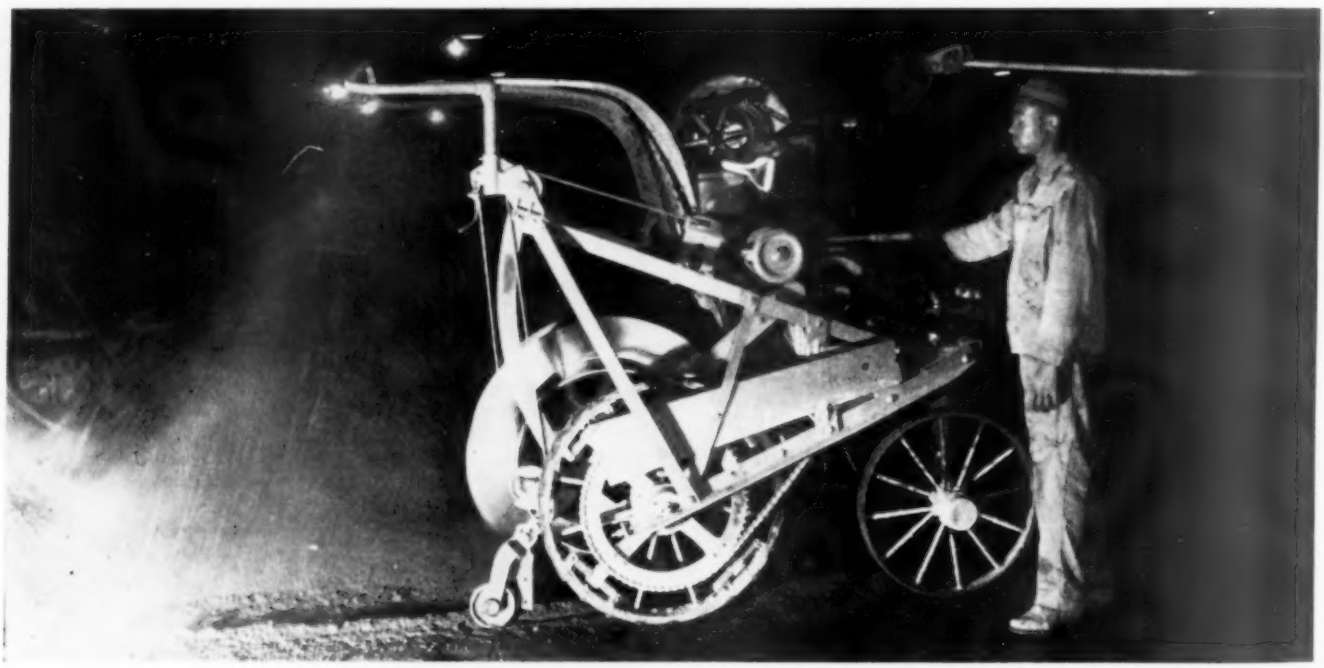
OVER 9000 SUCCESSFUL INSTALLATIONS

when are five men better than ten?

That's easy. Five men are better than ten when they can accomplish more work in a given period of time. And that is exactly what happened at the American Foundry and Castings Co. Inc. when they purchased a Sandcutter. Where originally 10 to 11 men were required on the night-shake-out crew, today, with a Sandcutter, only five men are needed to condition the sand . . . and they do it in far less time.

Absenteeism was formerly a serious condition with the night crew. By eliminating the "back breaking labor of continuous shoveling", Sandcutter disposed of their absentee problem. Another problem of poorly conditioned sand was easily solved by the Sandcutter, as its whirling blades thoroughly mixed and aerated the sand to make it loose, soft, fluffy and cool.

Maintenance costs, too, took a big drop with the purchase of the Sandcutter. According to Mr. Harvey Cross of this concern, replacement parts were always on order for their former sand conditioning machine. Since installing the Sandcutter they have not yet ordered a single replacement part. The Sandcutter can increase the productivity of your men. Write today for details.



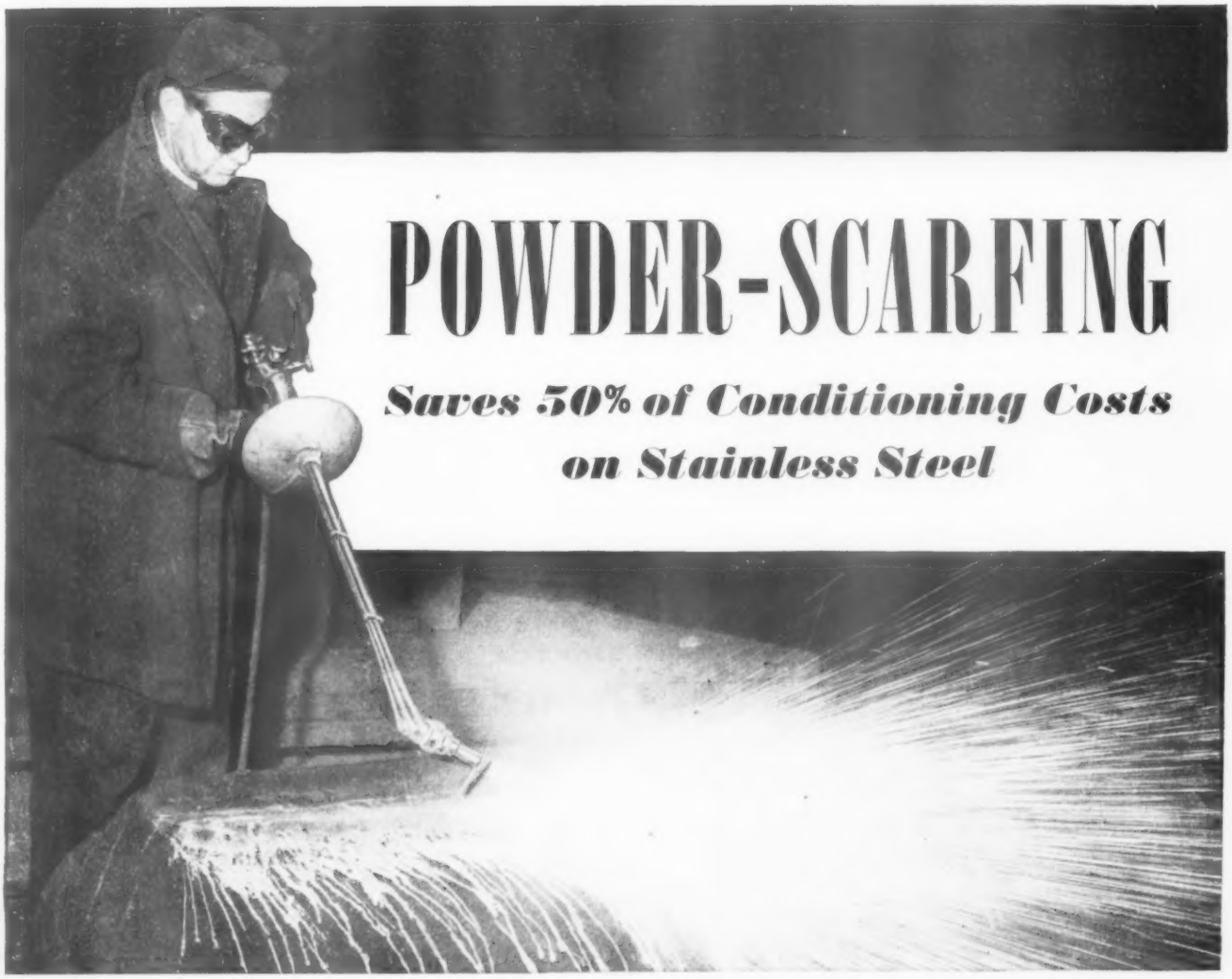
Shown above is the Model "AA" Sandcutter being used at the American Foundry and Castings Co., Inc., Jersey City, N. J.

WRITE FOR COMPLETE CATALOG

The "American Line" catalog illustrates and describes every Sandcutter model as well as all other American Products. Send for your free copy today.

American
WHEELABRATOR & EQUIPMENT CORP.
(FORMERLY AMERICAN FOUNDRY EQUIPMENT CO.)
505 S. Byrkit St. Mishawaka 2, Indiana

Sandcutters



POWDER-SCARFING

Saves 50% of Conditioning Costs on Stainless Steel

Here, a 3-ton ingot is being powder-scarfed, at a rate of 12 to 14 feet per minute.

LINDE's powder processes can save thousands of dollars a week in stainless steel production at your mill. To remove all the cracks and other defects that might occur in rolling a 12,000-lb. ingot would take about 48 hours by grinding. LINDE's powder-scarfing process makes the job easy . . . cuts the time to 4 to 6 hours. A heat of 22 to 24 1,000-lb. ingots can be powder-scarfed, using two blowpipes, in only one eight-hour shift—and at one-half the cost!

Scarfing will show up any imperfections; small cracks are never "smeared over."

Powder-cutting also speeds scrapping of stainless steel . . . hot tops can be removed from large ingots or bloomed ingots in a minimum of time . . . stainless steel slabs with cracked edges can be saved by cutting out the defects. Stainless steel plate can be easily cut to customer's specification.

LINDE's service engineers are always available to help in solving problems of treating, cutting, joining, and forming metals. Phone or write the nearest LINDE office.

Linde

THE LINDE AIR PRODUCTS COMPANY
Unit of Union Carbide and Carbon Corporation
30 East 42nd St., New York, N. Y. UCC Offices in Other Principal Cities
In Canada: DOMINION OXYGEN COMPANY, LIMITED, Toronto

The word "Linde" is a registered trade-mark of The Linde Air Products Company

"Uniform high quality at high speed... savings in new sand and bond... extremely low maintenance costs..."

Resulting from—

Mulling the sand every cycle in a *Simpson!*

Repcal BRASS MFG. CO.
PLUMBING · BRASS GOODS
2109-15 EAST 27TH STREET
LOS ANGELES 11
CALIFORNIA

March 25, 1947

National Engineering Company
549 West Washington Boulevard
Chicago 6, Illinois

Attention: Mr. Otto H. Rosentreter
West Coast Manager
Los Angeles, California

Dear Mr. Rosentreter:

When you called at our plant recently, you inquired regarding the performance of the sand conditioning system which National Engineering Company furnished for our foundry. For your information this equipment has been in daily operation since it was installed in 1940, and its efficient operation has enabled us to achieve production per man far beyond our expectations.

The Simpson Intensive Mixer and auxiliary equipment is giving us the closely controlled and uniform quality molding sand so essential for quality castings at high speed. In addition, it results in substantial savings in new sand and bond.

Maintenance costs have been extremely low on the National Unit. In fact, were I to build a new foundry I would duplicate the present system with no major changes. National has done a highly creditable job in designing and furnishing this equipment for our foundry.

Very truly yours,

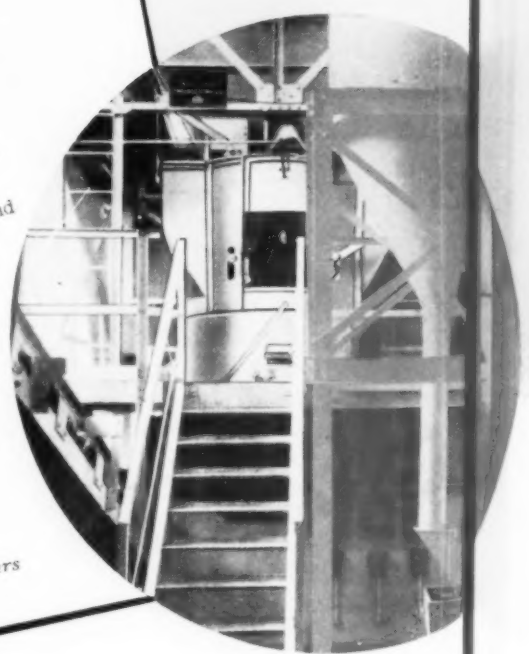
Geo. W. Fuller

Geo. W. Fuller
Plant Manager
REPCAL BRASS MFG. CO.

GWF:yw

Manufacturers of the World's Most Complete line of fine Showers

Shown below is a partial view of the Simpson Intensive Mixer installed at the Repcal Brass Mfg. Co., foundry, Los Angeles, Calif.

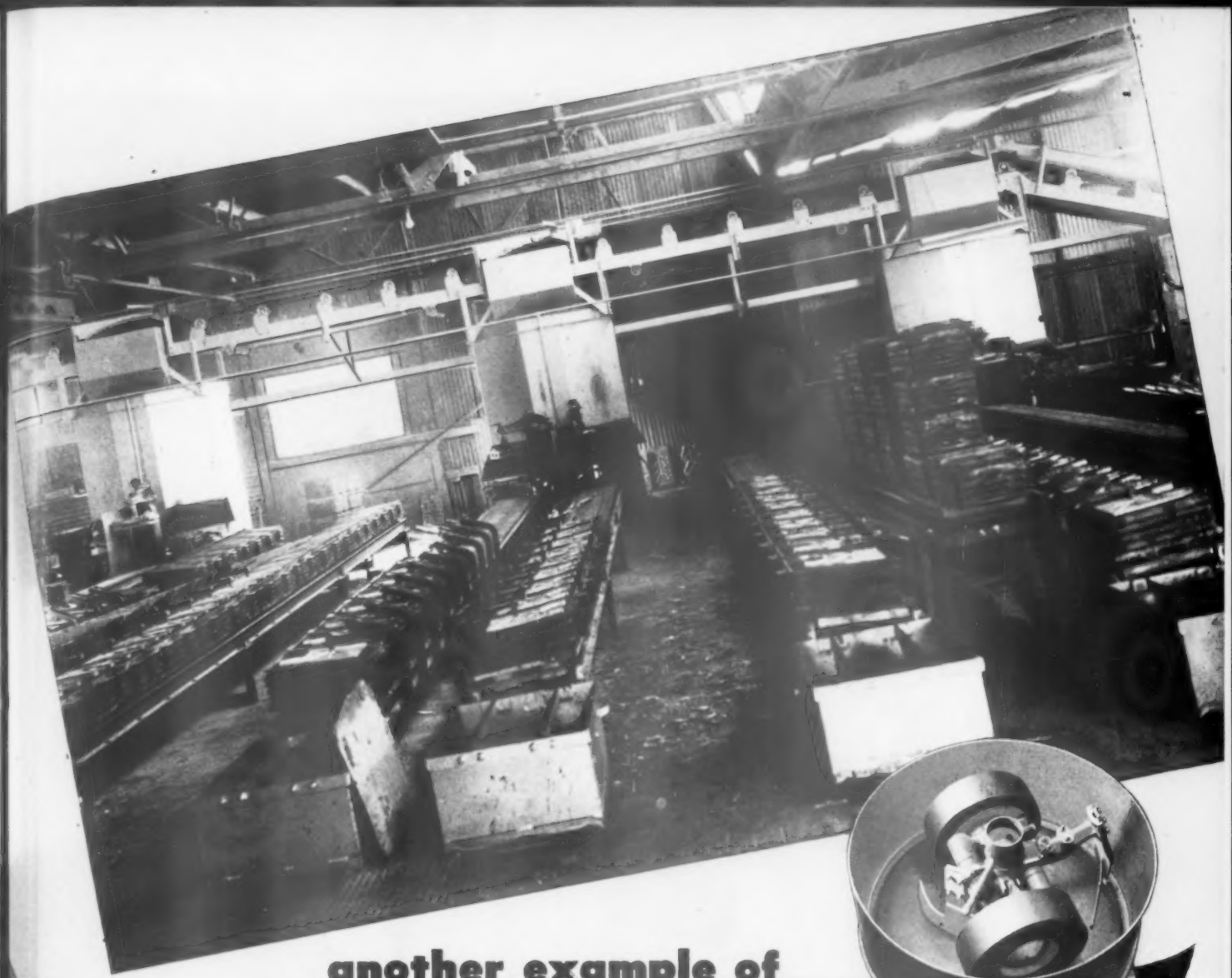


MANUFACTURERS ASSOCIATION, INC. FOUNDRY EQUIPMENT

NATIONAL ENGINEERING COMPANY

608 MACHINERY HALL BUILDING • CHICAGO 6, ILLINOIS

Manufacturers and Selling Agents for Continental European Countries—The George Fischer Steel & Iron Works, Schaffhausen, Switzerland. For the British Possessions, Excluding Canada and Australia—August's Limited, Halifax, England. For Canada—Dominion Engineering Co., Ltd., Montreal, Canada. For Australia and New Zealand—Gibson, Battle & Co., Pty., Ltd. Sydney, Australia



Interior view of a Simpson Mixer, showing the heavy mullers responsible for the efficient *controlled* mixing of foundry sands.

another example of the advantages offered to smaller foundries by SIMPSON *Intensive* MIXERS

• More and more non-ferrous foundries, including numerous smaller operators, are taking advantage of the lower production costs . . . lower operating costs . . . lower maintenance costs . . . less installation space required . . . faster production . . . and the constantly higher product quality available by the controlled mixing of sands in a Simpson Mixer.

A typical example of a small, yet complete sand preparing plant, designed around a Simpson Mixer, is demonstrated at the Repcal Brass Mfg. Co. foundry. This unit combines extreme compactness with ample capacity, flexibility, and simplicity of operation.

For proof of the advantages made possible by mulling the sand ***every cycle*** in a Simpson Intensive Mixer, we refer you to the letter reproduced on the opposite page . . . one of numerous such letters in our files attesting to the dependability of Simpson Mixers and National Engineering ***service.***

Let a National Engineer show you how to step up production, lower costs, and improve the quality of iron . . . steel . . . or non-ferrous castings. Write for details.

The large view above, shows six of the twelve molding stations at the Repcal foundry. Note the new type of mold clamp used in place of conventional weights. These ingenious clamps, designed by Mr. George Fuller, are now manufactured by National Engineering Company, and are available for industry-wide use.

EXACT TEMPERATURES

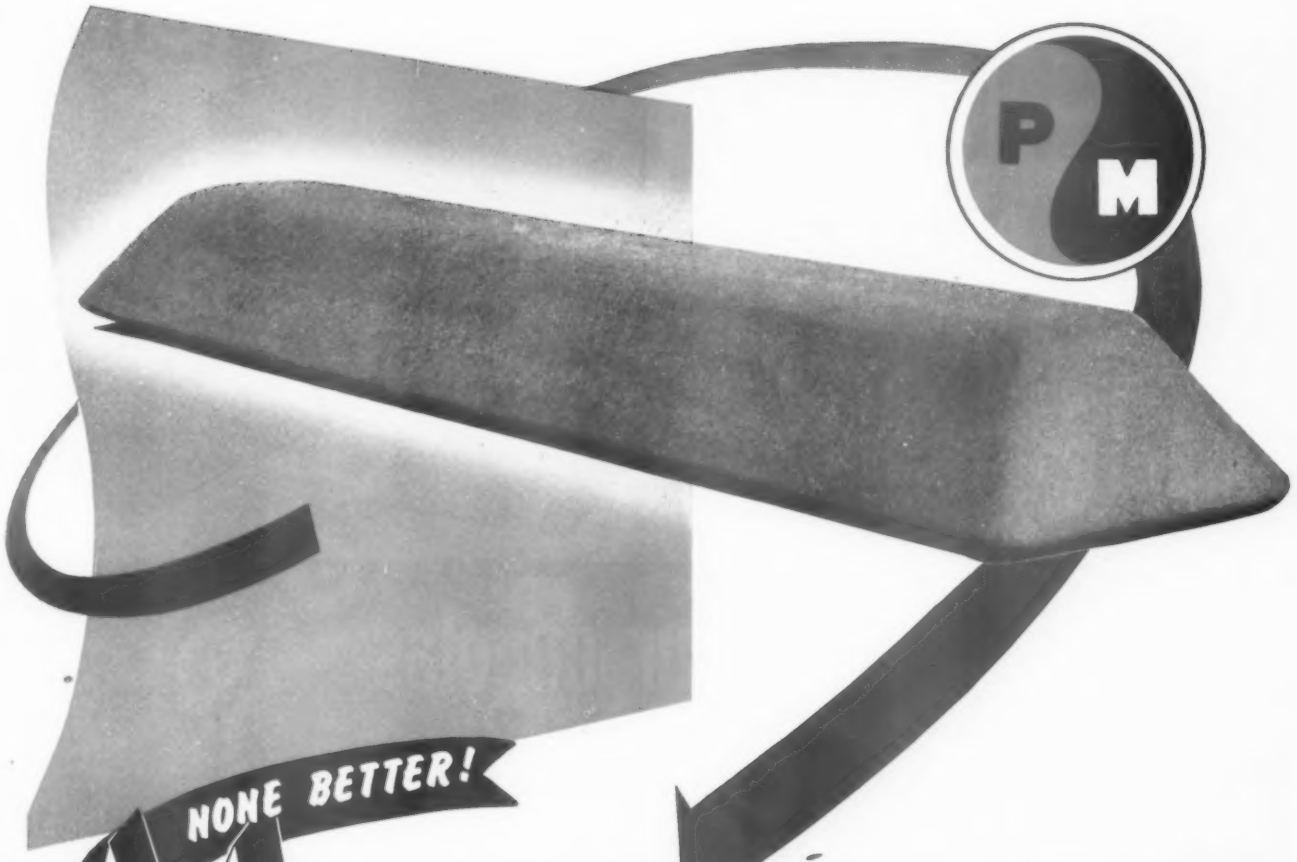
THE ESSENTIAL IN MODERN CASTING!

The nonferrous melting room foreman may have a lot of problems nowadays, but here is equipment that helps to eliminate the temperature control problem: Marshall Enclosed-Tip Thermocouples!

With these armored-tip instruments, he can tell just how hot his molten brass, bronze, aluminum or magnesium is at all times. As a result, the foundry produces finer castings, which pass every test for soundness.

Marshall Thermocouples are made in both "Ladle" and "Furnace" types, and for use in either stationary or portable pyrometer set-ups. Their reports are accurate, prompt and dependable. Write for copy of new complete Marshall Thermocouple catalog. L. H. Marshall Co., 270 W. Lane Ave., Columbus 2, Ohio.

MARSHALL
THERMOCOUPLES



MELTRITE

More Used Than Any Other MERCHANT PIG IRON

Such Preference Must be Merited!

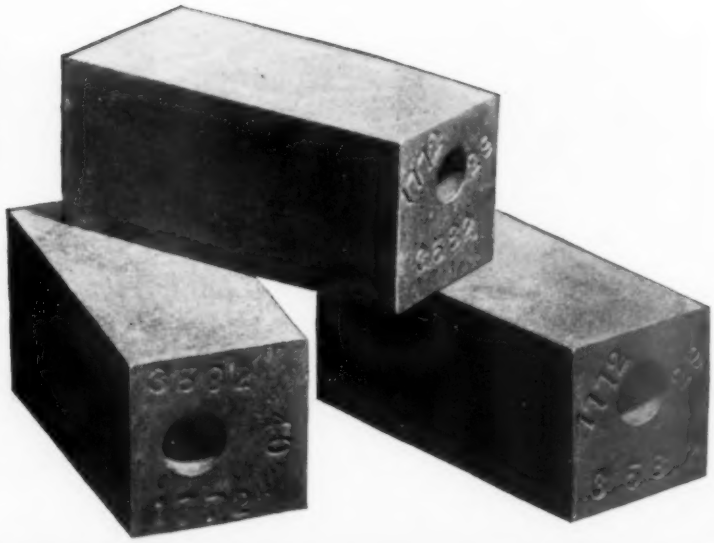
PICKANDS MATHER & CO.

CLEVELAND 14, OHIO

Chicago • Cincinnati • Detroit • Duluth
Erie • Grand Rapids • Greensboro • Indianapolis
Minneapolis • St. Louis • Toledo • Washington

IRON ORE • PIG IRON • COAL • COKE

DEPENDABLE SLAG HOLE BLOCKS



Slag hole block failures during a continuous-pour cupola run cease to be a problem with CARBOFRAX silicon carbide blocks on the job.

Retention of uniform hole size is assured by the dense slag-resistant CARBOFRAX blocks. Even with the blast on, rapid cutting away of this opening is avoided successfully. For runs of 18 to 24 hours duration, the slag stream stays almost constant. Troublesome, expensive shutdowns necessary for slag hole block replacement are eliminated.

In many plants, CARBOFRAX blocks are constantly proving their dependable durability. You, too, may profit by their use. Complete information, including stock sizes and dimensions of blocks for which moulds are available, can be obtained promptly by writing direct to Department B-118, The Carborundum Company, Refractories Division, Perth Amboy, New Jersey.

CARBOFRAX Slag Hole Blocks

BY **CARBORUNDUM**

TRADE MARK

"Carborundum" and "Carbofrax" are registered trademarks which indicate manufacture by The Carborundum Company

OLD TIMERS prefer Sterling

Ed Daehn, General Superintendent of Pelton Steel Casting Co., standing behind group of heavy duty Sterling flask sections.

These Sterlings have seen more than 15 years service at Pelton and are still usable.

After 40 Years in Foundry Work, Ed Daehn Still Sticks to Sterlings!

Ed Daehn, General Superintendent of Pelton Steel Casting Co., is an old timer in the foundry industry. Back in 1908, Ed became acquainted with Sterling Steel Flasks while serving his apprenticeship in the old B. Hoffman foundry. Today, after 40 years' service, he continues to be an enthusiastic Sterling booster. In the Pelton Foundry, Sterling Steel Flasks are used exclusively, just another indication that Sterlings "fill the bill."

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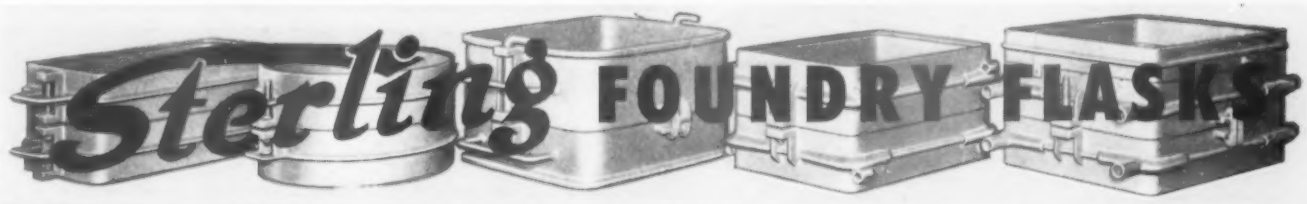
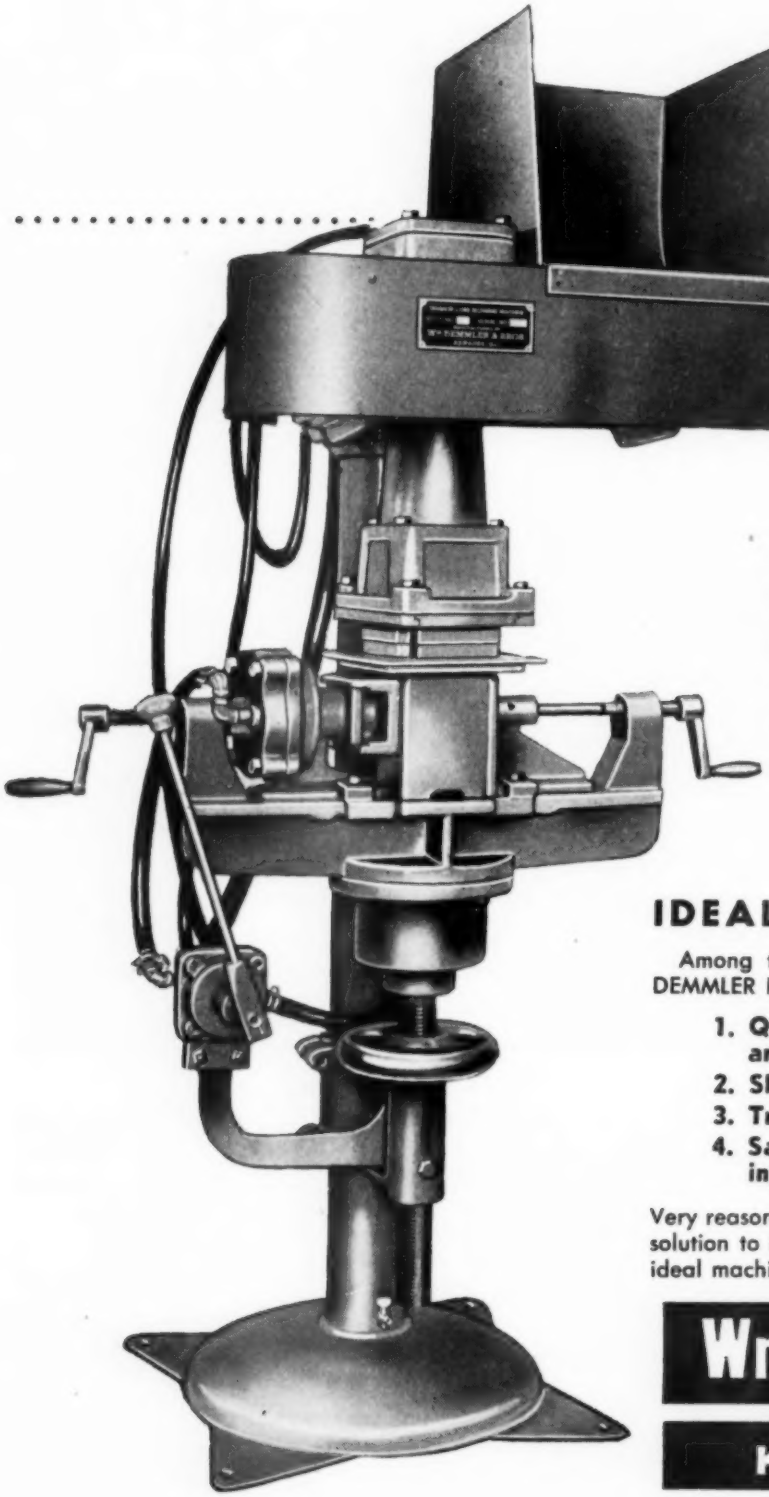
STERLING WHEELBARROW CO. • MILWAUKEE 14, WISCONSIN, U.S.A.



A 5500-1P-C

DEMMLER Core Blower

NO. 55



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2. **Sliding, quick change blow plates**
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4. **Sand magazine and carriage of aluminum castings, with ball bearing rollers**

Very reasonable in price, the DEMMLER No. 55 is the economical solution to the rapid production of high quality small cores—an ideal machine for any foundry whether large or small.

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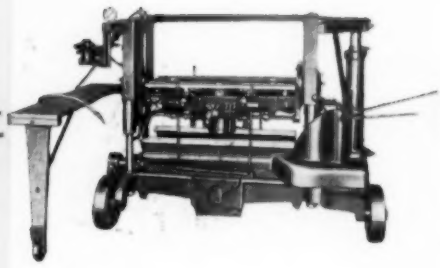
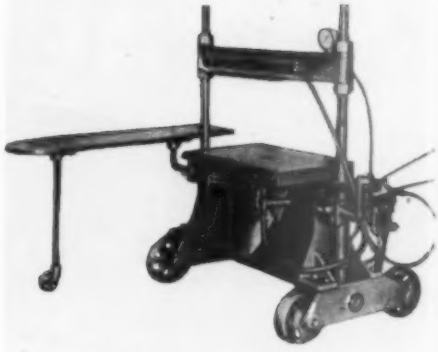
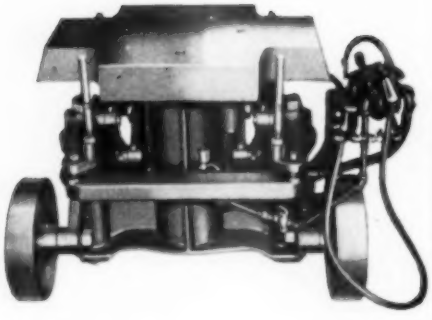
Jolt Squeezer—Arm type
5 sizes



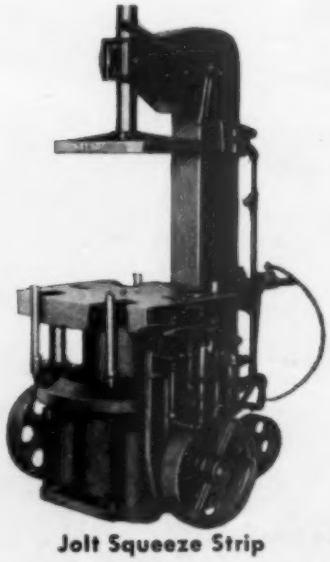
Jolt Rollover Squeeze Draw
4 sizes



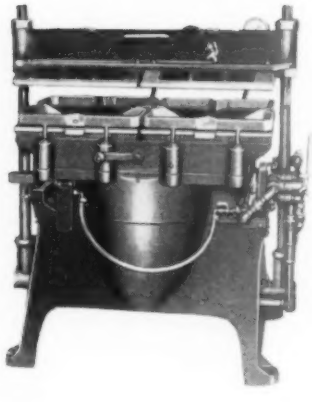
Jolt Squeezer—Strain rod type
2 sizes



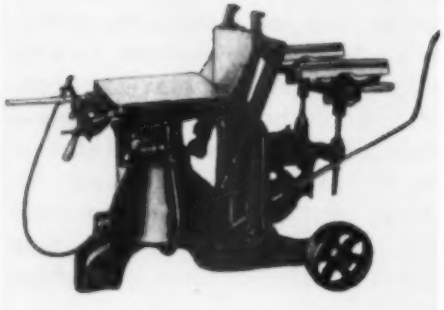
Jolt Pin Lift
3 sizes



Jolt Squeeze Strip
4 sizes



Multiple Molding
3 sizes



Jolt Rollover Draw
3 sizes

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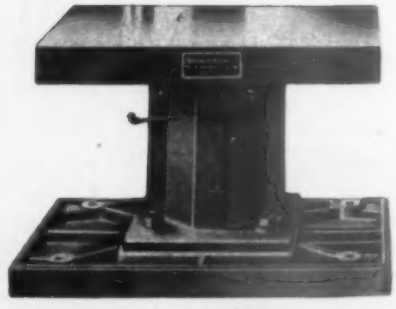


Plain Jolt
6 sizes

Let's Not Go Back To Mandatory Allocations

ALTHOUGH certain favorable factors are developing in the pig iron picture, shortages of metallics continue the major problem of ferrous foundries. Just when the supply will approach industry needs and foundrymen will be relieved from present procurement practices is problematical.

Speaking before the recent meeting of the Gray Iron Founders' Society in Atlantic City, John A. Claussen, Merchant Pig Iron Committee of the American Iron & Steel Institute, indicated that he is more optimistic concerning the pig iron situation than at any time since the end of the war. Most merchant blast furnaces now are in good repair and, barring accidents, should be kept in production for some time to come. Quality of coke appears to have improved slightly, which tends to increase furnace output. Amount of foreign iron reaching this country now ranges between 13,000 and 15,000 tons a month, an increase of nearly 100 per cent since earlier in the year. While imports are small in comparison with demand, and the price is high, numerous foundrymen are using this iron to excellent advantage.

Alex Miller, head of the Ferrous Scrap Division, Office of Industry Cooperation, Washington, likewise is optimistic over prospects for improving the amount of scrap available. After several years of talk, scrap metal is beginning to move in volume from Europe, and an organization is being established to step up these imports, which will include both steel and foundry scrap. Scrap drives also are being planned on a national level, and foundrymen should take an active part in these efforts.

Thus far the voluntary allocation program covering pig iron for veterans' housing has had little effect on the supply of iron available for all foundries. Reports indicate that foundries making castings included in the program have not been too interested in securing allocations. Since the law covering voluntary allocations expires Feb. 28, 1949, the time probably is too short to start any new agreements. But a new law, providing some type of allocations, may be expected from this 81st Congress.

Inadequacy of the pig iron supply has resulted in growing complaints from buyers as well as sellers of castings. These have joined the chorus which continues to stress the seriousness of the metallics situation. Expressions of dissatisfaction from users of iron and steel have reached such volume that the problem must be considered by the new Congress. Efforts are being made in some quarters to secure legislation which will control entirely the distribution of ferrous metals.

If industry is to avoid the headaches of mandatory allocations of iron and steel, the members of Congress must have the facts from industry. Why not discuss the allocations problem with your senator and congressman before they return to Washington?

Frank G. Steinebach

Editor

THE FOUNDRY
WHEREVER METALS ARE CAST

High-Silicon Cast Irons

RESIST HIGH TEMPERATURES

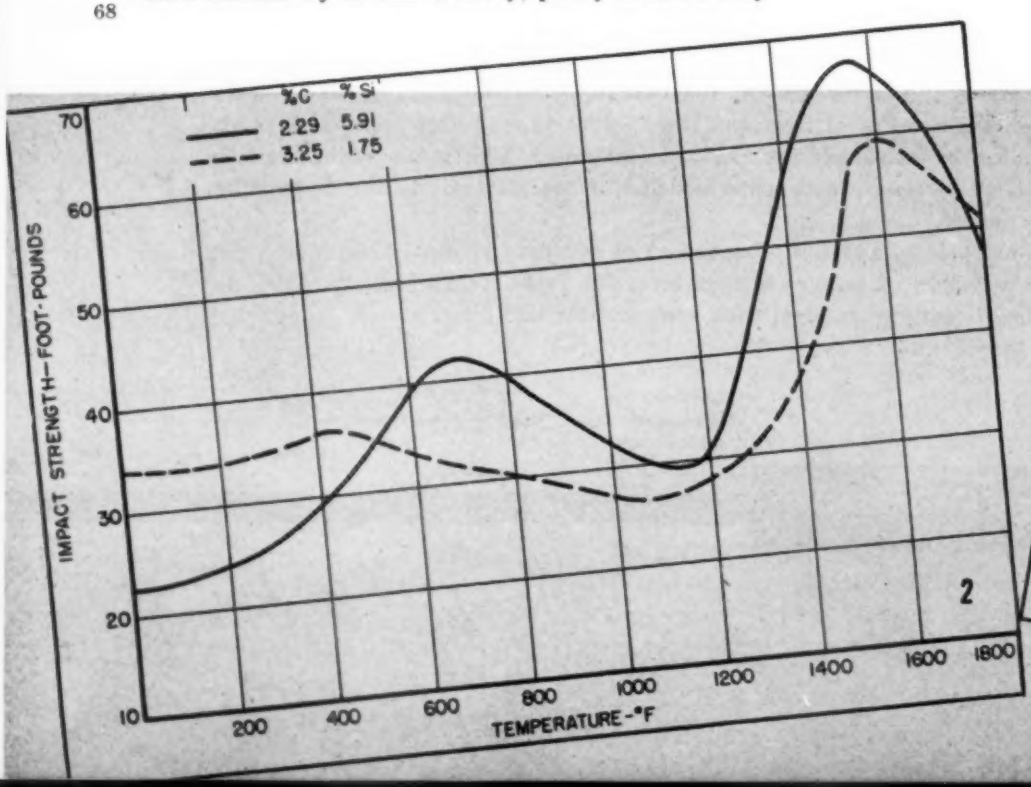
The investigation discussed here was undertaken to verify the claims made for elevated-temperature applications of high-silicon cast irons; to develop a technique for their economical production and to improve their characteristics for specific purposes. Data on the cause of growth also are presented

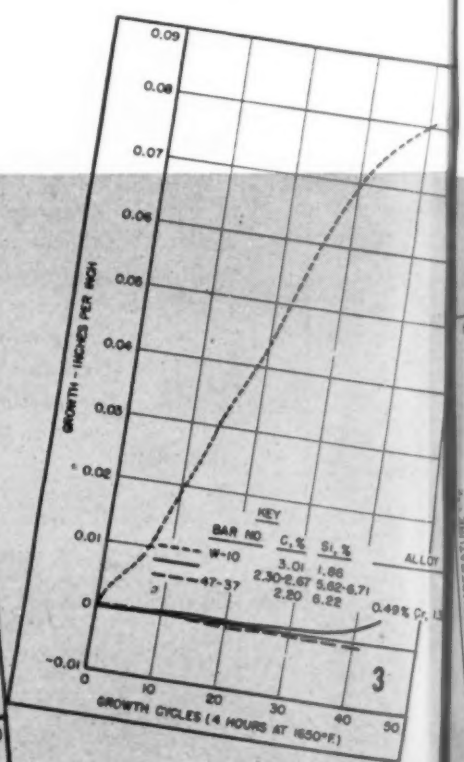
THE use of cast iron at elevated temperatures has been limited by the tendency for this material to undergo permanent dimensional increases (commonly called growth) with an accompanying loss in strength when alternately heated and cooled. Some cast iron parts fail in service as the result of growth, even in applications that do not require close dimensional stability. Typical examples of this type of failure are the warping and buckling of stove plates, furnace bowls, furnace grate bars, and the permanent molds used in the foundry and glass industries.

In 1928 the British Cast Iron Research Association applied for a patent covering irons, with fine graphite, containing over 4 per cent silicon to resist growth. These high-silicon cast irons have not been used extensively in this country, partly because very little is known about them and partly because they have gained the reputation of being extremely brittle.

It has been the object of the present investigation to verify the claims made for these irons, develop a technique for their economical production with modern American equipment, and improve their characteristics for specific purposes. All of these have been attained. Some interesting data on the cause of growth are also presented.

The inherent brittleness of cast iron containing over 4 per cent silicon is not to be denied. This brittleness, however, is a problem only at room and slight-





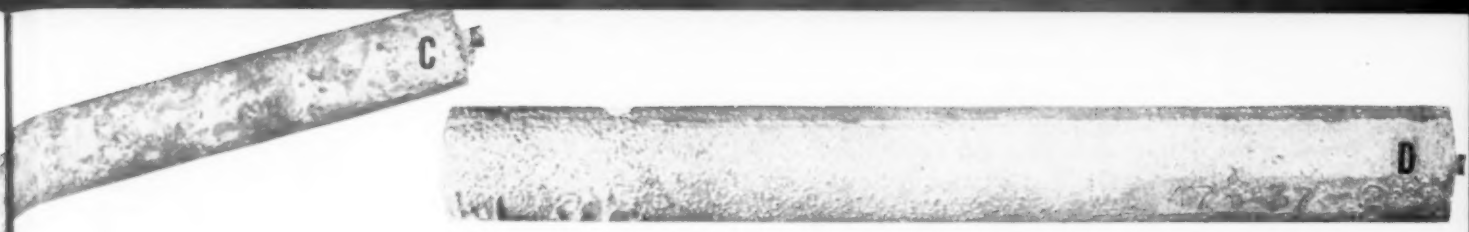


Fig. 1—Standard 10-in. growth test bars before and after cyclic heating. Bar *A* is a test specimen not heated and shown for comparison only. The other bars were subjected to 41 cycles, each consisting of heating to 1650°F, holding at temperature 4 hours, then air cooling to room temperature. Bar *B* is ordinary gray iron containing 3.25% C, 1.75% Si. This bar grew about 8% in length and scaled badly. Scale was tightly adherent. Bar *C*—2.35% C; 6.09% Si—did not grow; however, it scaled badly but scale was not adherent. Bar *D*—2.20% C, 6.22% Si, 1.32% Cu, 0.49% Cr—did not grow nor did it scale

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ly elevated temperatures. Fig. 2 shows curves representing the impact strengths at various temperatures for a cast iron containing 3.25 per cent carbon with 1.75 per cent silicon, and a high-silicon cast iron containing 2.29 per cent carbon with 5.91 per cent silicon. It is apparent from these curves that at temperatures above 500°F. the high-silicon cast iron has a higher impact resistance than does the ordinary gray iron. Thus, high-silicon cast iron parts require careful handling only at room temperature. After reaching service temperature, these high-silicon castings withstand greater impact than ordinary gray iron.

The greatest benefits to be derived from the use of 6 per cent silicon cast iron instead of ordinary gray iron for high-temperature applications are seen in a comparison of the growth and scaling properties of the two types of iron. Fig. 3 shows the growth curves for test bars subjected to cyclic heating. Each cycle consisted of heating to 1650°F, holding at temperature for four hours, and air cooling to room temperature. The ordinary cast iron grew about 8 per cent in 41 cycles while the high-silicon cast irons suffered practically no dimensional change.

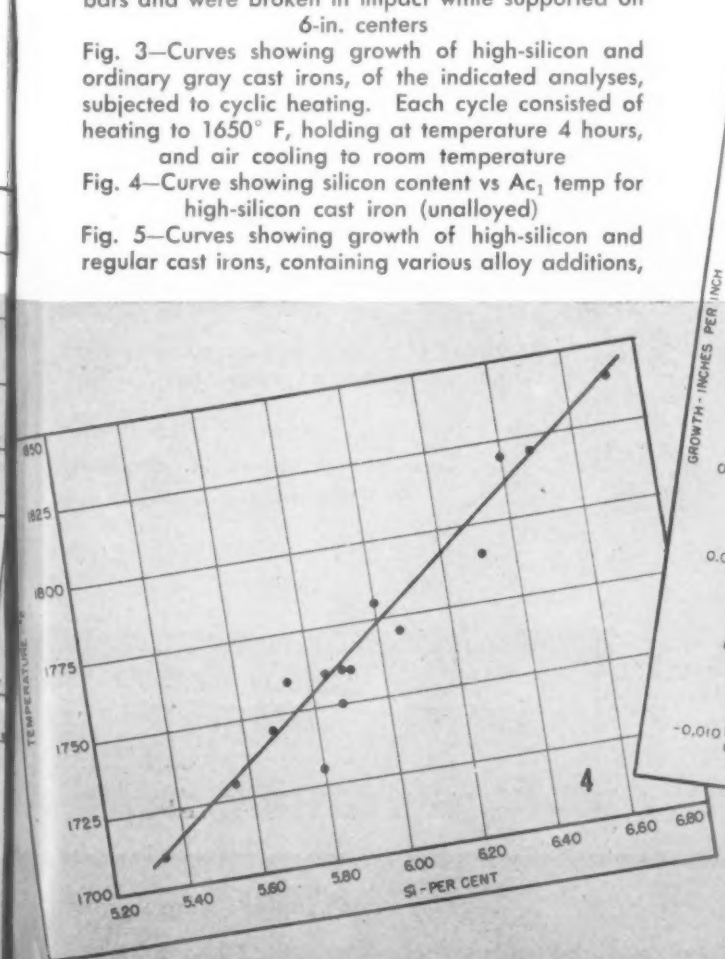
Fig. 1 shows representative growth test bars (after 41 heating cycles) used to obtain these growth curves. A standard growth test bar (*Please turn to page* 230)

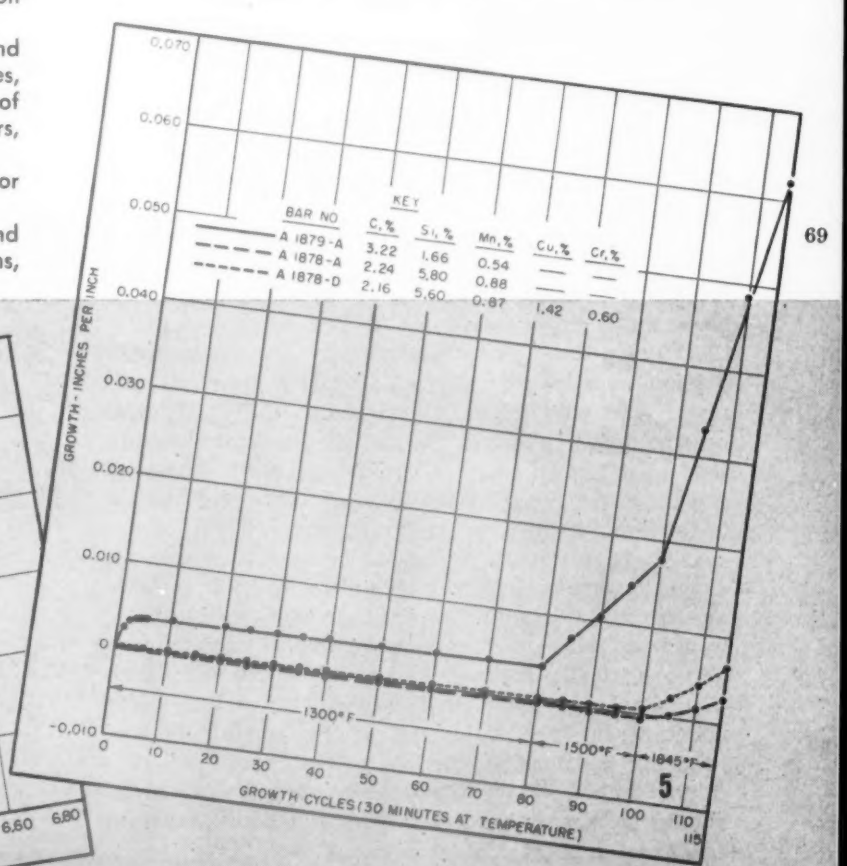
Fig. 2—Curve showing impact strength vs testing temperature for high-silicon and ordinary cast iron. Specimens were halves of 1.2-in. diam arbitration bars and were broken in impact while supported on 6-in. centers

Fig. 3—Curves showing growth of high-silicon and ordinary gray cast irons, of the indicated analyses, subjected to cyclic heating. Each cycle consisted of heating to 1650° F, holding at temperature 4 hours, and air cooling to room temperature

Fig. 4—Curve showing silicon content vs Ac_1 temp for high-silicon cast iron (unalloyed)

Fig. 5—Curves showing growth of high-silicon and regular cast irons, containing various alloy additions, subjected to cyclic heating. Each cycle consisted of heating to the indicated temperature, holding at temperature for 30 minutes, and air cooling





In his discussion of metallurgical considerations in the production of tin bronzes the author considers the causes and effects of gas evolution. This is the first of two articles on the subject

EFFECT OF GASES ON Tin

IN a previous article[1], the author presented his opinion of a probable mechanism of dendritic growth in tin bronzes and the effect of this growth on obtaining soundness in the metal. The article presented evidence that the dendritic growth is very rapid, equal in all directions, and forms a distinct cellular structure which builds up at approximately the same rate as the growth of the dendritic axes. It was pointed out that, if we pour at a low temperature and provide complete feeding until the casting is entirely solid, the complete formation of these cells should be inhibited and free flow of liquid metal should persist until each cell is filled completely with solidified metal.

Further, by providing complete feeding, interlocking dendrites, which are probably another cause of interdendritic shrinkage, will be broken thus permitting free flow of liquid metal into the interstices between the dendritic branches. The result of these two feeding actions should be the complete elimination of shrinkage porosity *provided no gas is evolved from the liquid metal or while it is solidifying in the mold.*

Fig. 3 shows the probable mechanism of dendritic growth. This illustration was presented in the previous article but is repeated here for convenience. Fig. 2 is an enlarged sketch showing single dendritic cells at the two extremes of orientation. We must assume that, at the time the six walls are completely formed, each cell will be filled with molten metal. On cooling a thin crust of the metal will solidify rather uniformly around the surface of the cell. There will be a contraction in volume as the metal solidifies, therefore a small cavity will remain at the uppermost portion of the cell. As solidification proceeds the metal wall will become thicker, also the cavity will become larger. Finally, when all the metal within the cell becomes solid, we would expect a cavity to remain, the volume of which would be equal to that of the liquid-solid shrinkage.

If there is no gas present in the metal, a vacuum should exist in this cavity unless metallic vapors are formed. One would expect then that each dendrite would be made up of a network of metal containing a geometrically arranged series of microscopic cavities. Probably such cavities would have but slight effect upon the properties of the metal, beyond lowering the density. Theoretically if every cell contained such a cavity the density of the solid metal should be almost exactly that of the liquid metal at the exact instant that it began to solidify.

We seldom, however, find a series of cavities extending completely throughout the dendrites, although we can usually find a few by examining any piece of bronze under the microscope. It is probable that, as the cavity would contain only a vacuum, and as there is a certain considerable inward pressure, the thin weak walls of the cells will be broken or bent, permitting complete filling of the cell. In addition we should not lose sight of the possibility of each cell becoming completely filled with solid metal before all the cell walls have formed completely which would also account for the absence of cavities.

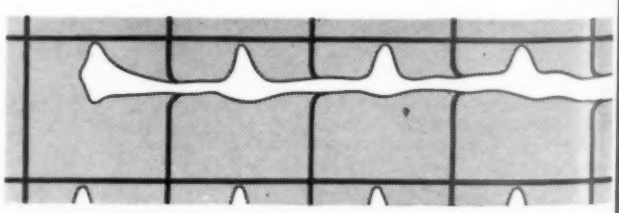
The preceding description is based upon the assumption that no gas is dissolved in the molten metal in excess of the amount which will remain completely in solid solution in the metal. Any gas which will remain in solution in the solid metal should have no adverse effect upon the solidification. If, on the other hand, gas is present in amounts in excess of that which will remain in solid solution, the excess will be set free completely during solidification. Referring again to Fig. 2, as the metal enclosed within the cell freezes, it will eject this excess gas. Instead of the cavity being a vacuum, a certain gas pressure will be built up, the amount of such pressure depending upon the amount of gas dissolved in the metal at the time freezing begins.

Any gas present in the microscopic voids will tend to prevent external pressure from bending or break-

Fig. 1—Formation of channel through adjacent cells. Channel caused by excess gas

Fig. 2—Solidification of tin bronze in completely formed cells

1



n Bronze

By CLYDE L. FREAR
Senior Materials Engineer
Bureau of Ships, U. S. Navy
Washington

ing of the walls inward and will, in turn, prevent filling of the voids. Larger amounts are likely to produce pressures in excess of that exerted by the weight of the liquid metal and of the atmospheric pressure upon the riser, and may result in breaking of the cavity. Excessive amounts of gas may cause the fracturing of the walls of adjacent cells and result in the formation of a continuous channel similar to that illustrated in Fig. 1. These continuous cavities are usually of microscopic size which will account for the fact that excessive leakage may occur in what appears to be sound metal.

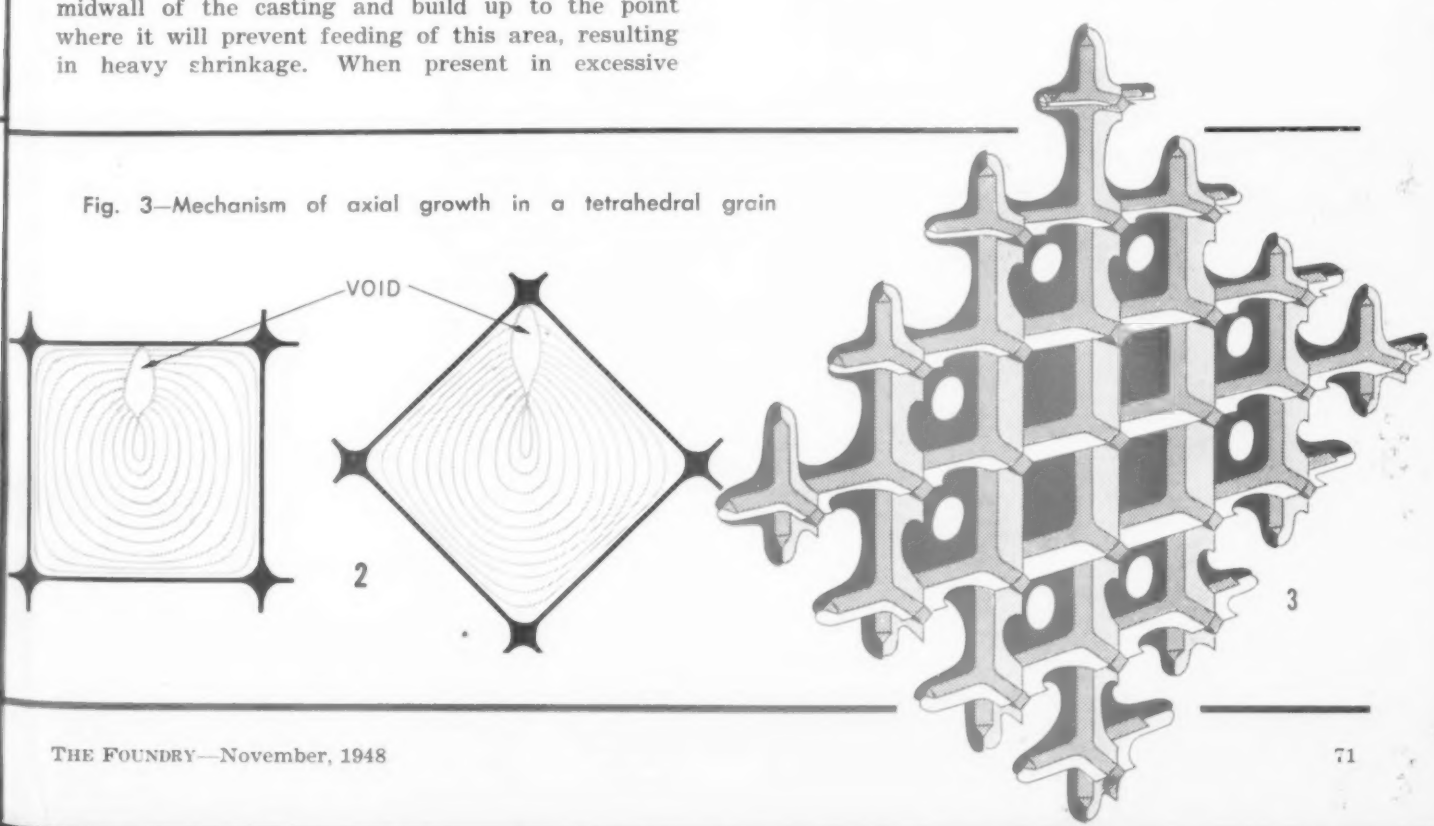
It is probable that such channels will take a zigzag path through the dendrite instead of the straight path indicated in the sketch. As a result they are usually difficult to detect by microscopic examination. By careful polishing and examination under the microscope, followed by additional polishing and examination, the author has succeeded in tracing the path of such channels completely through comparatively thin walled castings. Their existence in thin walls indicates almost to a certainty that similar channels will be present in heavy and more slowly cooled castings.

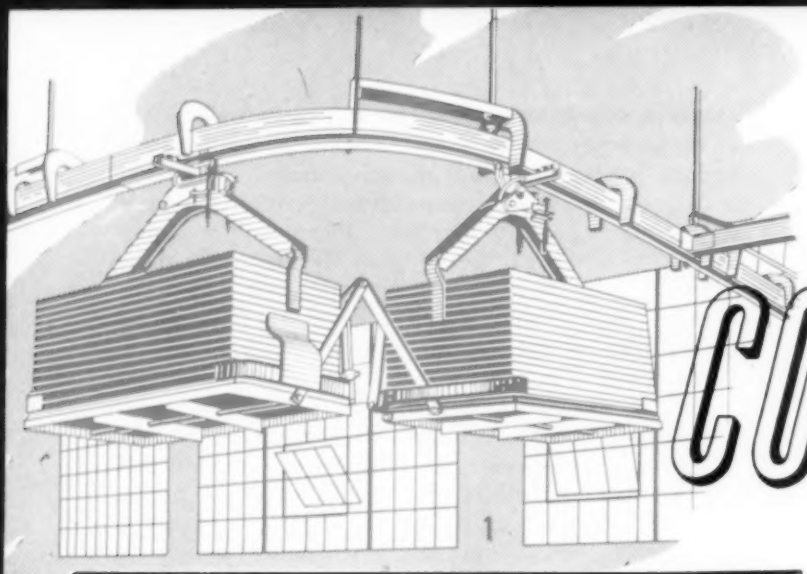
As the gas is expelled from the solidifying dendrites, its volume will tend to increase toward the midwall of the casting and build up to the point where it will prevent feeding of this area, resulting in heavy shrinkage. When present in excessive amounts, it will even force the still molten metal out of the risers resulting in the so-called purging. Under certain conditions, when purging occurs there may be a fairly heavy and concentrated evolution of gas which begins at the surface. Peculiarly in many cases where we get heavy pinhole formation, most of the excess gas is evolved during the time that the pinholes are forming, with the result that the metal in the core of the casting is comparatively sound, contrary to what we would expect in the normal formation of shrinkage porosity.

Solubility of Gases—In any discussion on the effect of gases, it is necessary to consider the amount and the relative solubilities of the gases in the metal. Probably all gases are soluble to a certain extent in every solid metal, but are much more soluble in liquid metal. The solubility increases as the temperature of the metal increases above the melting point. If we can keep the amount of the dissolved gas below the limit of solid solubility of that gas in the particular metal, no separation of gas should occur upon solidification of the melt, and the deleterious effect of the gas would be prevented. It is only when the amount of dissolved gas is greater than the limit of solid solubility that trouble from this source will occur.

In general, if even a trace of gas escapes during solidification, porosity will result which, in turn, will aid in the formation of interdendritic voids. The term "in general" is used advisedly as the solubility of any gas may be increased in the solidifying metal by an increase in external pressure. Incipient tendencies to porosity because of dissolved gas in amounts just above the solubility limit may, therefore, be prevented by the use of high risers, centrifugal casting, or by any method which will increase the pressure upon the metal while freezing. A thorough discussion of the effect of pressure would lead us deeply into the (*Please turn to page* 142)

Fig. 3—Mechanism of axial growth in a tetrahedral grain





By WILLIAM G. GUDE
Managing Editor
THE FOUNDRY

CONVEYOR SYSTEM features

Fig. 1—Scrap hoppers, one of four different types of cars employed in overhead conveyor system at modernized foundry of Aluminum Co. of America, Bridgeport, Conn.
Fig. 2—One of two loops in the sand foundry. Each loop is served by three electrically operated trains for conveying molds
Fig. 3—Molding stations are furnished sand by overhead belt conveyor and molds are set out on nearby conveyor cars. Poured molds are dumped onto grating at right
Fig. 4—One side of double line of 600-lb. capacity melting furnaces. Thermocouples are shown over each furnace
Fig. 5—Elevator for transferring hot metal to second-floor permanent mold foundry

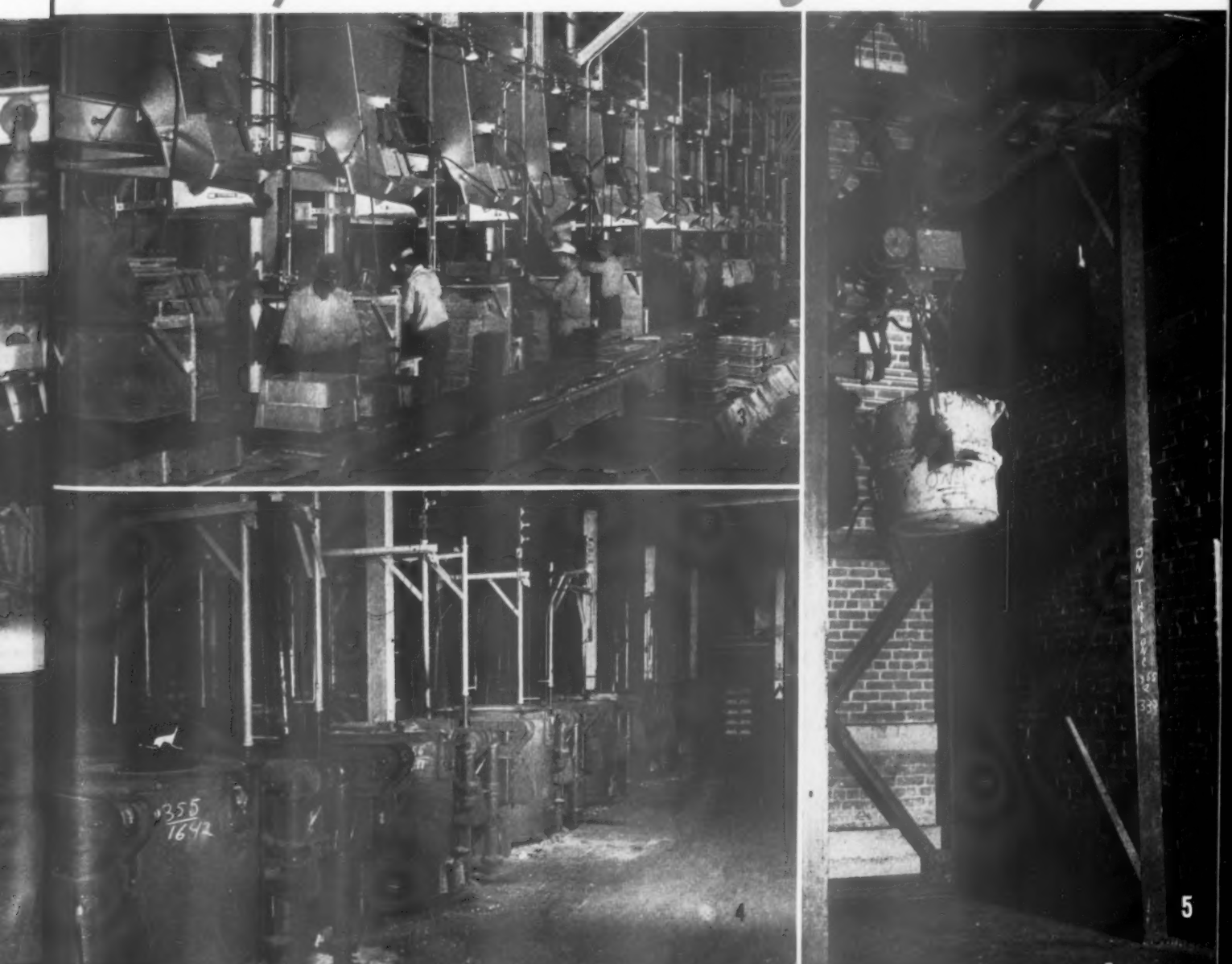
...es modernized aluminum foundry

ALUMINUM Co. of America's recently modernized foundry at Bridgeport, Conn., is an outstanding example of the extent to which mechanization can be effected in large-scale jobbing type operations. Considering that this foundry regularly handles 200 to 300 pattern changes monthly—occasionally as many as 1000—and is designed to produce both sand and permanent mold aluminum alloy castings, the problem of providing efficient materials handling and work scheduling obviously has been no small one.

Although the plant buildings are not new, the Bridgeport foundry represents a $2 million program of redesigning and re-equipping the structures, which had been virtually idle since V-J Day. The plant was purchased by Alcoa from the Crane Co. in 1941 and was equipped for the wartime production of castings. It was a leader in mass production of aluminum air-cooled cylinder heads for military planes, turning out over 100,000 heads per month at the peak. In addition, part of the plant was used to make magnesium castings during the war years. The end of hostilities terminated these operations, and production of aluminum castings again was concentrated at the company's older foundry at Fairfield, Conn., about 5 miles from Bridgeport.

Alcoa's decision to reactivate the Bridgeport works has meant the end of castings production at Fairfield. One important factor in this decision was that a large majority of the latter's employees could, without inconvenience, go along with the transfer of operations to Bridgeport. The old plant recently was sold. This move had its historic aspects in that the origin of the Fairfield plant goes back to 1905—a relatively long period so far as the aluminum foundry industry is concerned. In that year the Fairfield Aluminum Foundry Corp. was started in an old church building. New and enlarged structures were added by this and successor companies in later years, and the plant which Alcoa now has disposed of was completed in 1929.

The Bridgeport plant includes four main buildings having nearly 380,000 sq ft of floor space. As indicated on the accompanying layout sketch,



CONVEYOR SYSTEM

some of the buildings are multi-storied. The second floor of one building houses the offices, an attractive cafeteria seating 250 persons, and a modern locker and wash room which can accommodate more than 1500 workers. Permanent mold casting is conducted on the third floor of this building.

Hot metal for the permanent mold foundry is obtained from the central melting department located in an adjoining building, which also includes the sand foundry and the department for rough trimming of castings. A third building incorporates finish trimming, inspection and shipping departments on the first floor, coremaking on the second and core sand mixing on the third. The fourth main building is devoted to ingot production and storage, and maintenance. Good ventilation, adequate illumination and general cleanliness and orderliness all contribute to unusually good working conditions throughout the plant.

The most interesting mechanical feature of the plant is its conveyor system, which efficiently handles the flow of materials between the different departments in much the same manner that the nation's network of railroads provides the arteries of traffic between cities. Considering materials handling as a whole, the plant actually employs several different conveyor systems. These include mold conveyor trains in the sand foundry; an overhead monorail system for handling molten metal; overhead and underground belt conveyors for transporting molding sand, and an elaborate power and free conveyor system for moving cores, castings and scrap.

This last-named system, which is unique in application to the foundry industry, has a total length of more than 2½ miles. It is particularly well adapted to a plant of this type where materials must be transferred to different floors of the buildings

Fig. 6—Transferring metal from bull ladle to a holding furnace in sand foundry. Poured molds are in foreground

Fig. 7—Core blowing machines in coreroom. Sand is received through chutes from floor above

Fig. 8—Plant layout sketch showing location of various departments

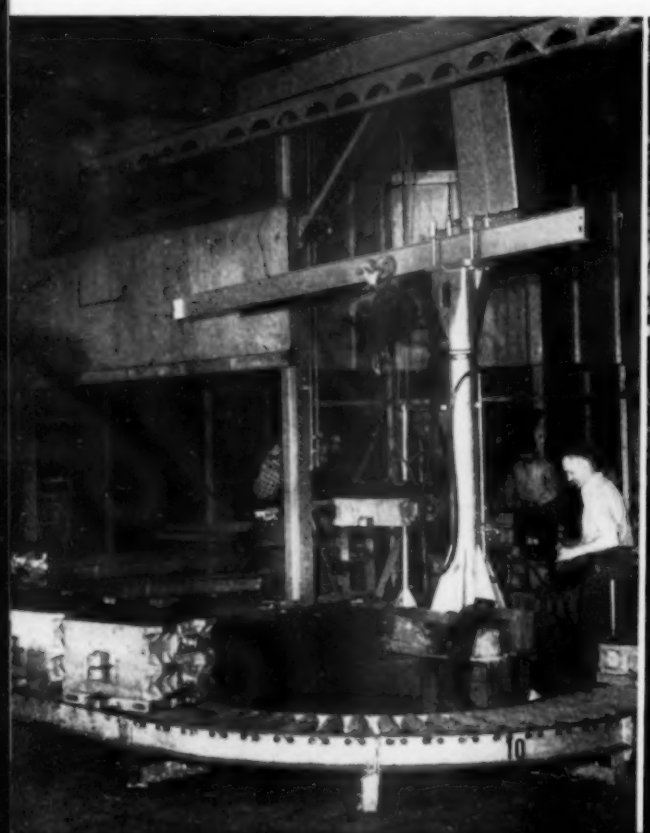
Fig. 9—Truck Load of cores being placed in one of the six baking ovens

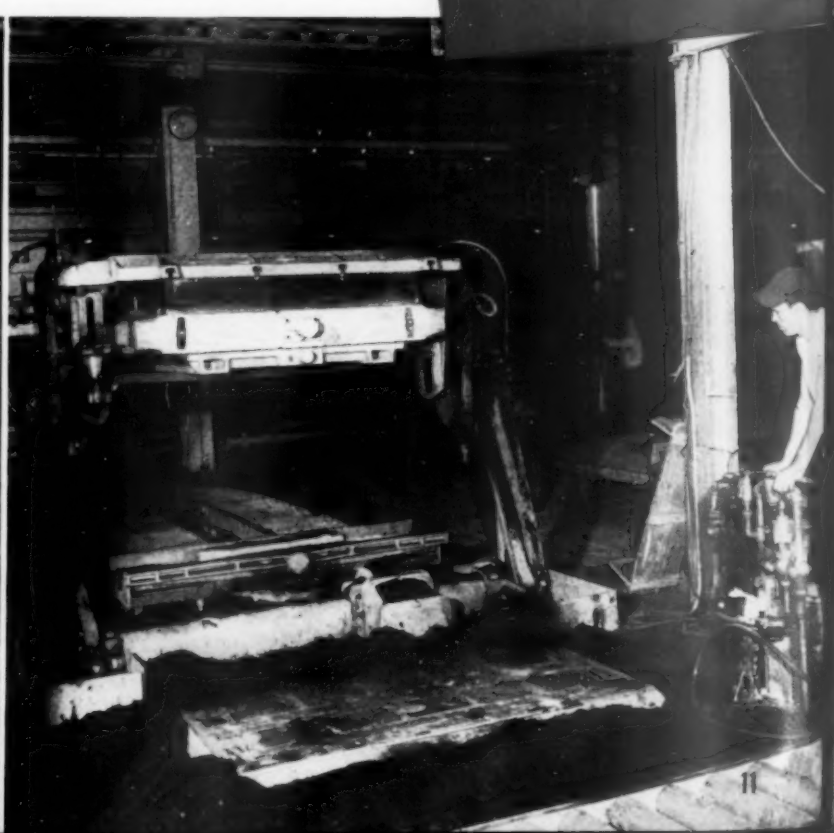
Fig. 10—Larger molds set out on roller conveyor for pouring

Fig. 11—Rolling over a mold on 6000-lb capacity molding machine preparatory to drawing pattern

Fig. 12—Motive type sandslinger is used to ram molds for certain of the larger castings

Fig. 13—Raising a core carrier to the conveyor system for transfer to the sand or permanent mold foundry




1ST FLOOR- TRIM-INSPECTION SHIPPING
2ND FLOOR- CORE ROOM
3RD FLOOR- CORE SAND MIXING
1ST FLOOR- INGOT ROOM- MAINTENANC
2ND FLOOR- IDLE SPACE

23

6

7

OUGH
RIM
SAND FOUNDRY
MELTING ROOM
SCRAP STORAGE
LOCKOUT
T FLOOR- PATTERN STORAGE & REPAIR - MACHINE SHOP
STORE ROOM - FIRST AID
2D FLOOR-OFFICES-CAFETERIA - LOCKER ROOM
3D FLOOR-PERMANENT MOLD CASTING FLOOR
ABORATORY

8

9

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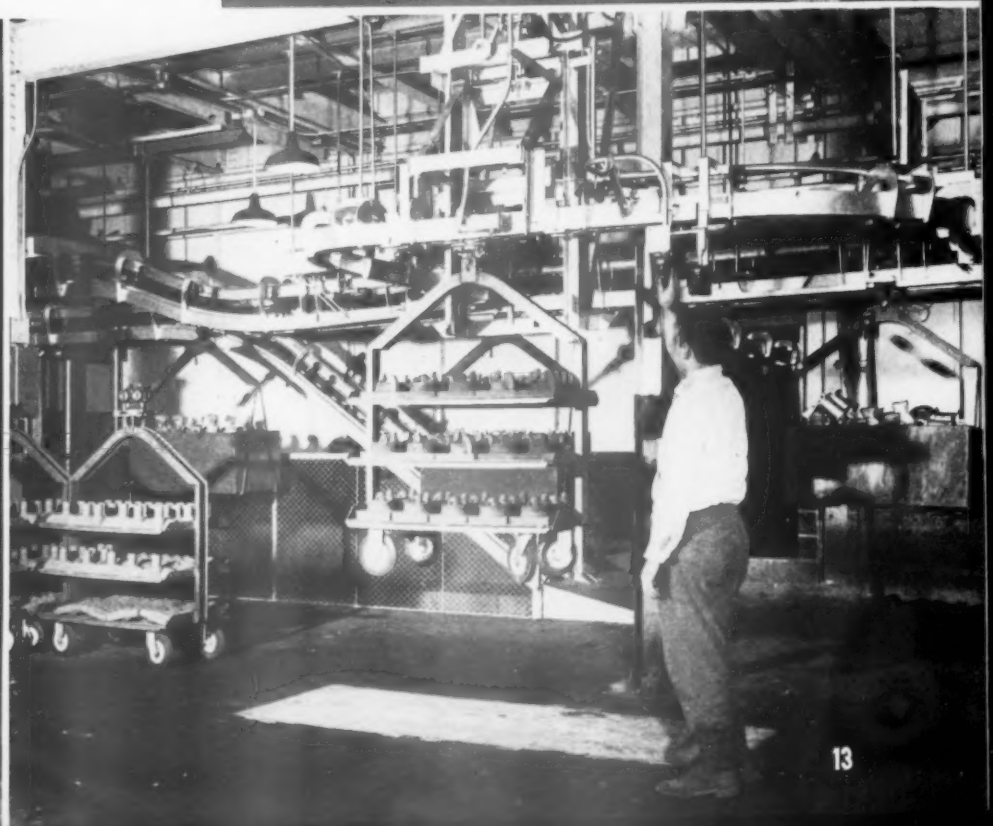


13

CONVEYOR SYSTEM

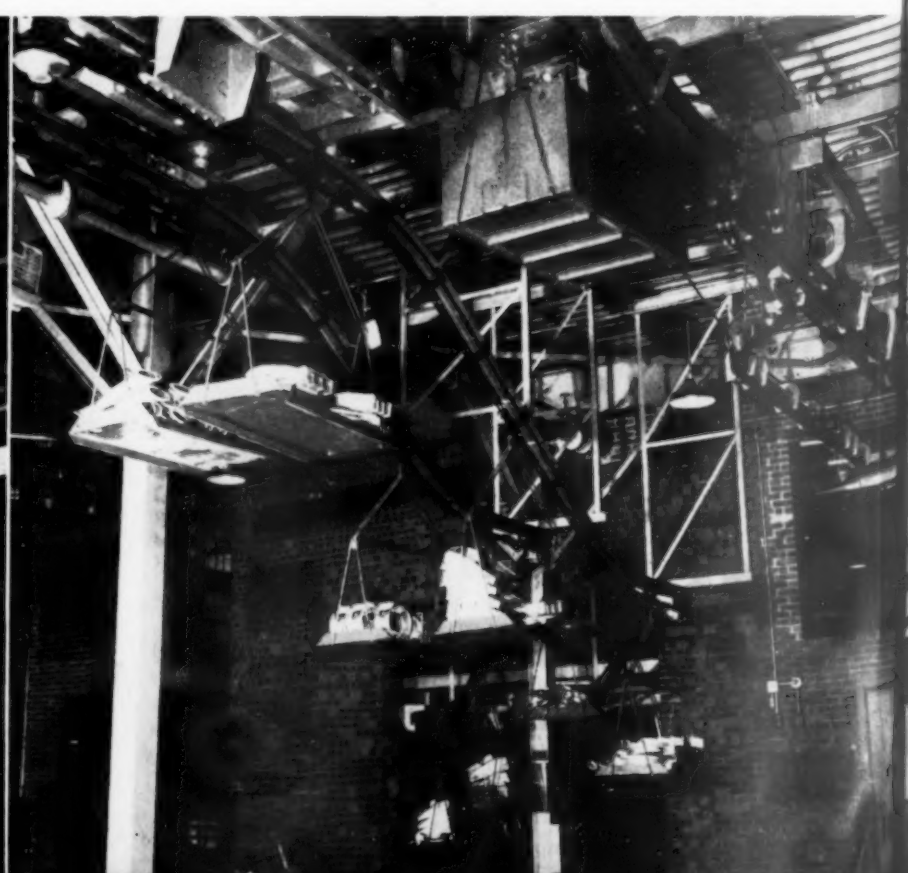
and where one department feeds into two other departments, or vice versa. For instance, the coreroom serves both the sand and permanent mold foundries, and both foundries move castings into the cleaning department.

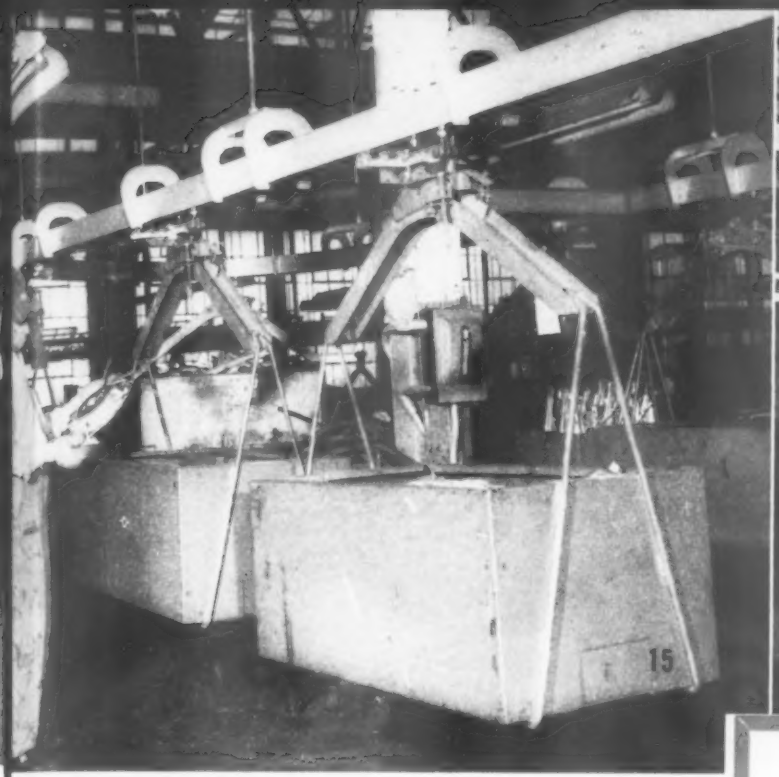
While the conveyor line travels continuously, gravity loops are located at certain loading points onto which the cars are switched off automatically. This automatic feature, accomplished through adjustable controls on the cars, also applies in all other switching needed for the cars to arrive at their proper destination. Another instance in which the system has reduced or eliminated manual effort in a number of operations is in the rough trim department where the turn of a lever is all that is required of a band saw operator to dispose of a hopper load of accumulated gates and risers. But the conveyor sees that the scrap eventually reaches the melting room. Transfer of hot metal to the permanent mold foundry also is accomplished automatically, an elevator raising the bull ladle with its section of monorail to the third floor where the ladle is connected to a continuation of the monorail system.

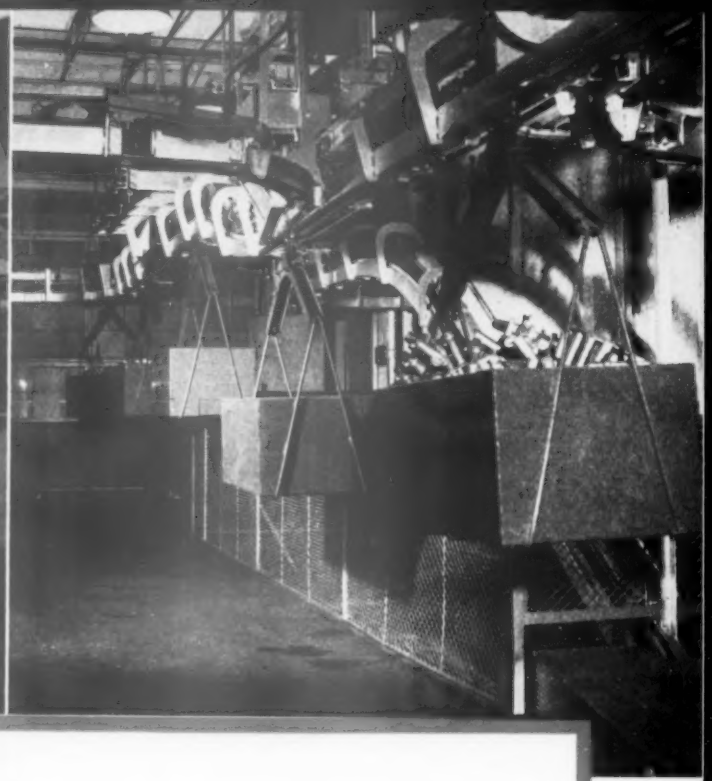
The main power conveyor extends from the melting department through the sand foundry, cleaning and finishing rooms, coreroom, and permanent mold foundry. Although not actually one continuous line, the ability of cars to switch from one line to another

makes it essentially a complete unit. One exception is the tote pan trolley chain conveyor in the finish trim, inspection and shipping departments. The transfer feature is not required here because the use of removable tote baskets provides the same desirable feature of utilizing the conveyors for transportation only, all operations being performed while the work is stationary.

Four different types of conveyor cars are employed. For transporting cores (Fig. 13) a rack type car equipped with wheels is used. Rough castings are handled in the box type car shown in Fig 15. In







the finishing department the castings are stacked either loosely or in baskets on the cars shown in Figs. 21 and 22. Hopper cars (Fig. 1) are used to transport return scrap from the rough trim department to the melting room, and are equipped with drop bottoms for easy unloading.

Castings ranging in weight from a few ounces to 2000 lbs are produced in the sand foundry, where mechanical equipment is employed for handling sand and molds in bench, rollover machine and floor molding. Smallest castings are made on two loops, one of which is shown in Fig. 2. Each loop incor-

Fig. 14—Pouring large molds. Metal is transferred from the furnace room by an overhead rail system

Fig. 15—Checking castings at an operating station in the permanent mold foundry. Carriers have come from the power conveyor in background onto this gravity loop where they remain until loaded before being returned to power conveyor system

Fig. 16—Loaded hopper approaching a switch-over which will direct the castings downstairs to the trimming and finishing department

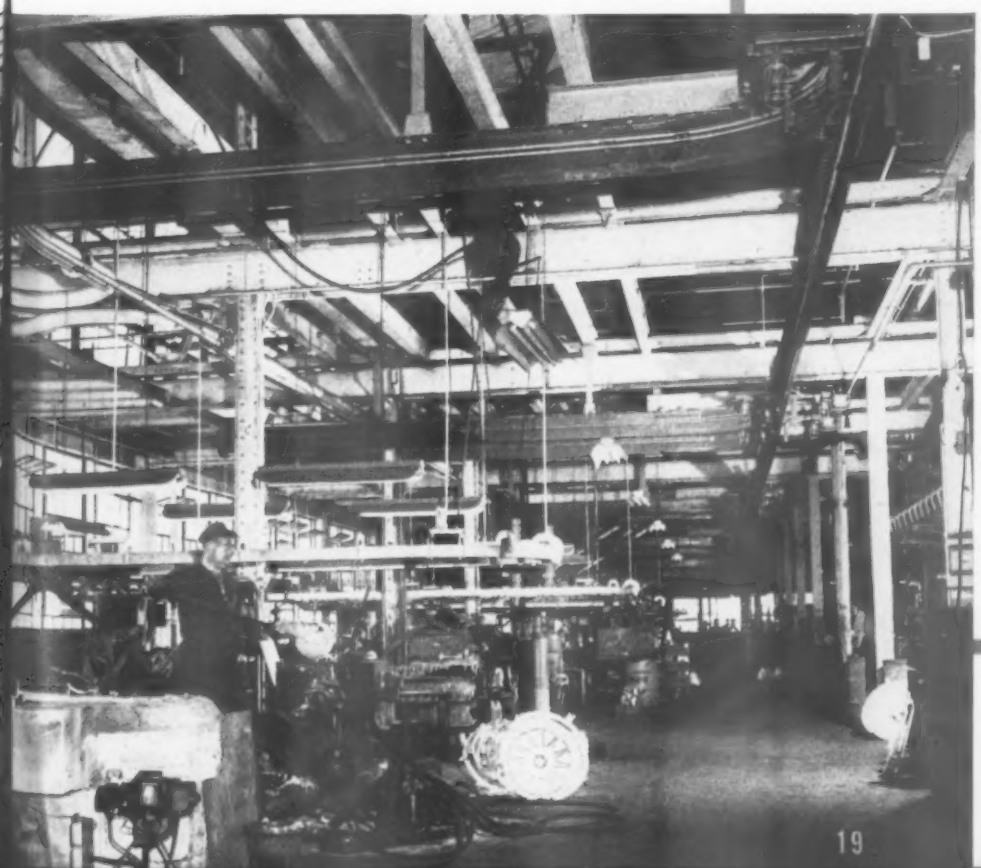


Fig. 17 — Automatic electric hoist which raises scrap hoppers to line leading to storage area beyond wall at left

Fig. 18—Switching point where cars automatically switch from one conveyor line to another depending upon their destination

Fig. 19—Partial view of permanent mold foundry floor. It incorporates 15 work locations

CONVEYOR SYSTEM

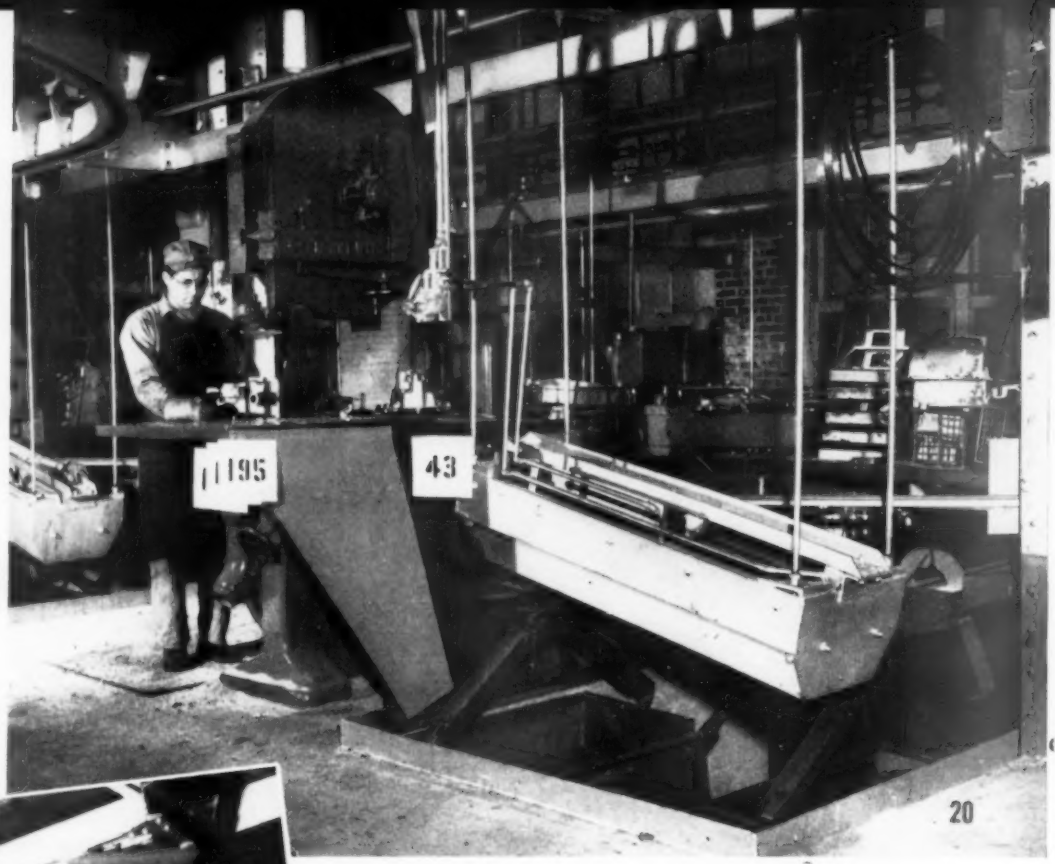


Fig. 20—Preliminary rough trimming. Gates and risers fall into hopper in pit and castings are placed in basket, then loaded on conveyor in background

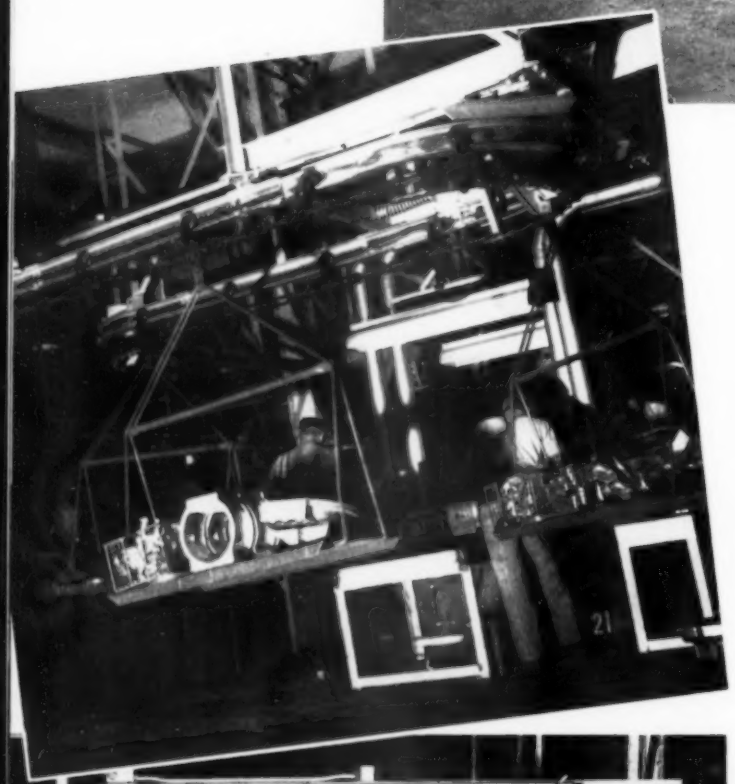


Fig. 21—Castings arriving at the final grinding and trimming locations on flat tray conveyor cars

Fig. 22—Part of the trim room operation, showing conveyor which delivers castings and subsequently transports them to inspection and shipping departments

porates 12 molding machines consisting of 8 jolt-squeeze units for matchplate work and 4 paired machines of the same type for cope and drag work. Molds are set out and jacketed for pouring on a conveyor train consisting of an electrically operated driver and 18 carriers. Each loop has three trains. The train cars, 22-in. wide and spaced on 5-ft centers, are numbered to coincide with the molders' work stations. The trains stop at the same pouring stations each time they travel the loop. In this manner, molds are located for the pouring of particular alloys. Each loop can accommodate six different alloys or metal pouring temperature limits simultaneously. The bench molds are poured at 1320 to 1420° F, floor molds from 1300 up to 1500° F.

Cores are received at the molding floor on the rack conveyor cars shown in Fig. 13. These cars are used only for transfer of finished cores, the conventional racks being used for handling green cores. The coreroom, located on the second floor of a building near one end of the sand foundry building, receives its mixed sand through chutes leading from the floor above to the nine core blowers (shown partially in Fig. 7) and 30 benches where cores are made. A bucket type elevator transports sand to the mixing floor, and the mixed sand discharged from the mixer is dumped by cart into the individual chutes. Dyes of various colors are mixed with the sand for certain cores to assist in identifying the sand mix.

Cores from the blowers (*Please turn to page* 156)

Rating Better People IN OUR FOUNDRIES

The foundry industry's main competitive job today is to obtain the best possible individuals in its ranks, according to the author in this address presented before the recent annual meeting of the Gray Iron Founders' Society

By WILLIAM B. GIVEN
President
American Brake Shoe Co., New York

OVER the long range, each industry's future is more dependent on the kind of people in it than on any other one element. Experience proves, at least to me, that an industry can get "right" people only by deserving right people. There is only one way to deserve them. That is to so build—today and tomorrow—that our industry and our company will gradually grow to be more and more the kind of place we would like to have take us on if we happened to be looking for a job. We won't accomplish this unless we plan to that end.

The keenest competition each of us has is no longer our sales competition with other companies. Our main competitive job, the one of first importance, is to get the best possible individuals to become members of our organizations. Succeeding in this, we can handle getting a bit more than our share of the going demand for our products.

It is just as sane to try dodging the effect of gravitation as it is to deny that, long range, the future of each business will depend on what kind of people it has a few years hence. We can't build such personnel by advertising for it. We can't buy it merely with the offer of a fatter pay envelope. If we are to attract them, we must "rate" better people than the neighbors with whom we are competing for their service.

The academic problem of "How can we rate the best?" is simple. Its accomplishment is difficult. Have you ever tried making a list of the things you would wish to find if you were enlisting in a company for what you hoped would be your work life? Assume you are twenty-one and are being offered jobs by a dozen companies, in work that seems down your alley. Then try making a list of the things you would look into. I have done this, trying to help young college boys size up companies they were considering joining. Doing just that helped me to crystallize our Brake Shoe shortcomings—the things which needed changing, the things which would improve our competitive position in rating better people than neighboring plants and companies. By making such a list you see your company from an entirely different angle and the result is apt to be something of a shock!

If you believe your company's being able to get the best in people is all important, I think just making the list will turn out to have been an important step forward. That list will goad you on to make things better. Once in a while I take a fresh look at my own list. It certainly does put heat on me!

Stepping back forty years to the age of twenty-one, looking for a job, my first study would be of a company as it was. That would be the easier study—getting figures and facts, finding some friend who could tell me what kind of human beings were in top and supervisory jobs. These items would be essential. They have most to do with the immediate future. But assume I am hoping to stay with the same company until the Reaper comes, or the first pension check is only a month off. If at all intelligent I am going to base my final decision in guessing about the company's progress in the next forty years or more.

But first about the company as it is. Some of the things to check, if every kind of information were available, are:

1. Its stock ownership.
2. Its comparative balance sheets.
3. Its comparative earnings statements.
4. Its products.
5. Its markets and market positions.
6. Its sales stability.
7. Its policies as to insurance, pensions and other security provisions.
8. Its pay policies—comparatively.
9. Its engineering and research.
10. Do good people stay on and seem to enjoy their work?
11. Are promotions normally from within the ranks? In other words, do they gamble on their own people?

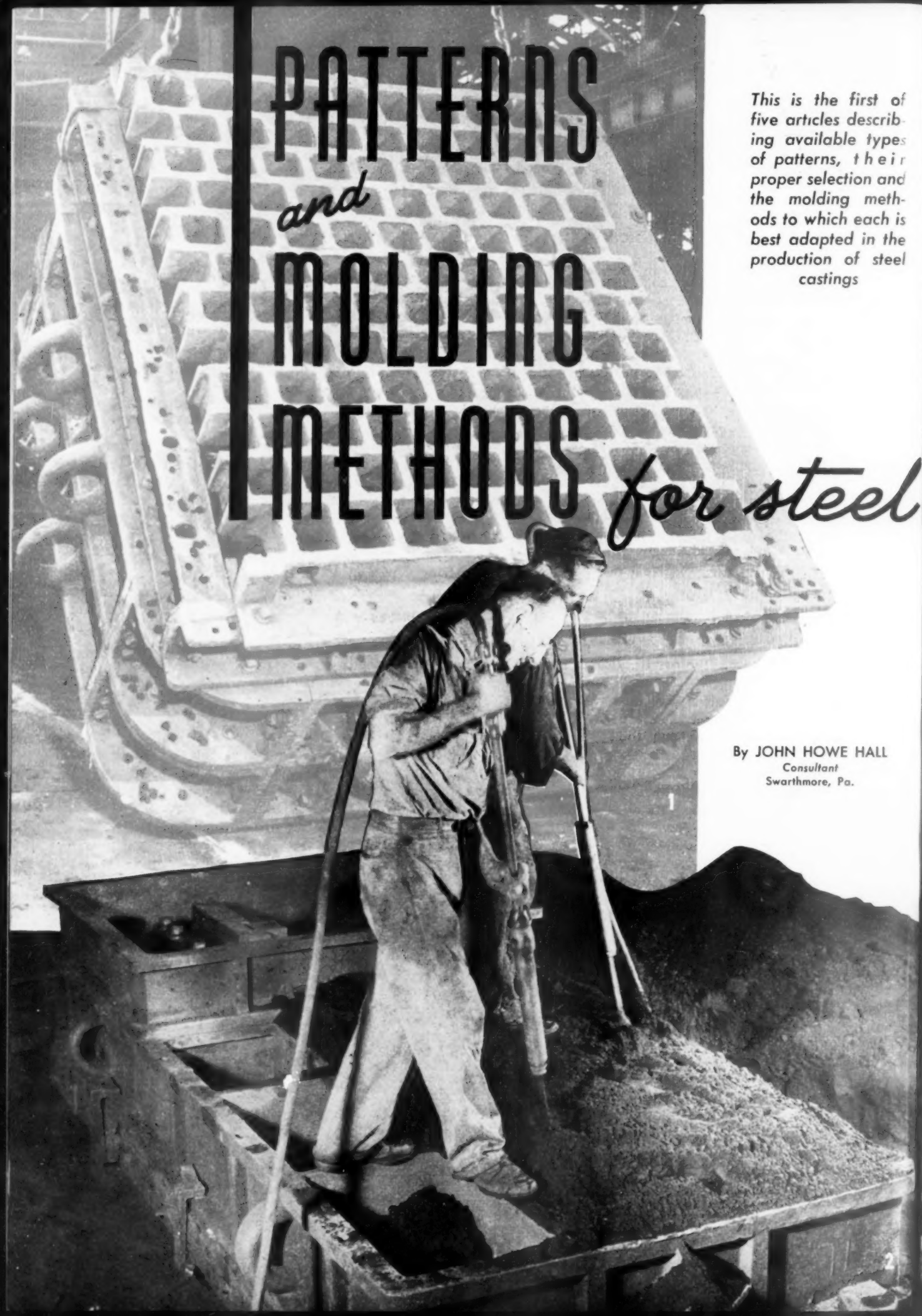
When you finish the list of questions you will be surprised by its length. Also, you will be surprised by the number of things you will want to change in your company.

But even more impor- (*Please turn to page* 146)

PATTERNS *and* MOLDING METHODS *for steel*

This is the first of five articles describing available types of patterns, their proper selection and the molding methods to which each is best adapted in the production of steel castings

By JOHN HOWE HALL
Consultant
Swarthmore, Pa.



THE producer of steel castings is obliged to provide himself with the necessary patterns, regardless of how many of a particular piece are to be furnished. Since patterns are by no means cheap, the money spent for them may make up a considerable cost of the castings, especially when only a few castings are to be made from each pattern. Hence the foundryman in planning his work must give considerable thought to the problem of keeping this item to a minimum.

To go too far in economizing on pattern costs, however, is by no means always good policy. Ramming up the molds for castings is at best a time-consuming and expensive operation, and a new mold has to be made for each casting. Inadequate or unsuitable patterns always greatly increase the time required to produce the molds in the foundry, and may result in poor molds and second-rate castings that require a lot of extra work in the cleaning room to make them fit for use. Thus the money saved by the pattern shop in making cheap patterns may be spent many times over in other departments of the plant, so that the foundryman "saves at the spigot only to lose at the bunghole."

It should not be assumed, however, that the best possible patterns should always be furnished to the foundry. In deciding upon the type of patterns to be made, the foundryman should keep in mind the number of pieces that are to be produced from them, and whether or not they are to be stored and used again later. If but one or two molds are to be produced, it may be advisable to make a very cheap pattern, even though its use may involve extra expense in molding. This is especially true when no further orders for the casting in question are anticipated. On the other hand, if it is expected that at comparatively long intervals the pattern may again be used to make a few castings, better materials and workmanship are called for, because a cheaply constructed pattern tends to warp in storage, or be damaged in handling. If this occurs, it may be found when the pattern is brought out for re-use, that it requires extensive repairs, or even complete replacement. A pattern that is to be used to produce a great many castings, of course, should be made of the best materials and should be so constructed that it will stand up for the longest possible time to the wear and tear of service.

Detailed descriptions of patterns and equipment for various methods of molding will be found in many books on foundry practice. Since castings obviously cannot be made without molds, and molds cannot be made without patterns, a textbook on steel casting manufacture must consider this subject in a broad way, quite as much as, for instance, the several steelmaking methods and the kinds of work for which each process should be used. What is attempted here is to give in outline the characteristics of the various types of pattern equipment from which the maker of steel castings must choose, with a brief description of the conditions under which each type is to be preferred, and the molding methods to which each is best adapted.

castings

Fig. 1—Large drag flask with grid in place

Fig. 2—Half pattern placed on a heavy board and flask is clamped to the board

Fig. 3—Striking off the excess sand on a flask

Fig. 4—Pattern in place and first of several cheek flask sections set on drag

Patterns and Molding Methods . . .

When small castings are to be made, a pattern is almost always used that makes up the outline of the entire piece being molded. Similar equipment is often, but not always, necessary for the production of pieces of comparatively large size. Frequently the sink heads or risers that compensate for the shrinkage of the steel as it solidifies, and at least part of the gate through which the steel enters the mold, are formed by suitable pieces made as integral parts of the pattern. Depending upon the molding method to be used, the pattern may be made in a single piece, or split into at least two parts, and may be "loose", or attached in a more or less permanent manner to some sort of mounting.

These "full patterns" that form the entire outline of the piece are often much more expensive than other kinds of equipment that may be used to produce certain types of medium sized and heavy castings. The foundryman, therefore, should consider carefully the possibility of using some of these other kinds of rigging to make his molds. Depending upon the conditions encountered, he may be well advised to choose sweeps, segmental patterns mounted on pivoted arms, or skeleton patterns. The mold may even be made up of a number of separate parts, put together somewhat as a child makes a house out of building blocks. The equipment of the foundry, especially the type of hoists and cranes available, and the size of the castings to be made, largely govern the choice among the many possible types of pattern and methods of molding.

"Loose" patterns, so-called, that are practically models of the castings to be produced from them, are sometimes made in a single piece. More often, however, a pattern of this (*Please turn to page* 212)

Fig. 8—Molding a large ship casting by bedding in a suspended pattern

Fig. 9—Completed drag mold for turbine casing

Fig. 10—Block pattern in place ready for ramming

Fig. 11—View of a large pit

Fig. 12—Parting line follows profile of the pattern to eliminate backdraft

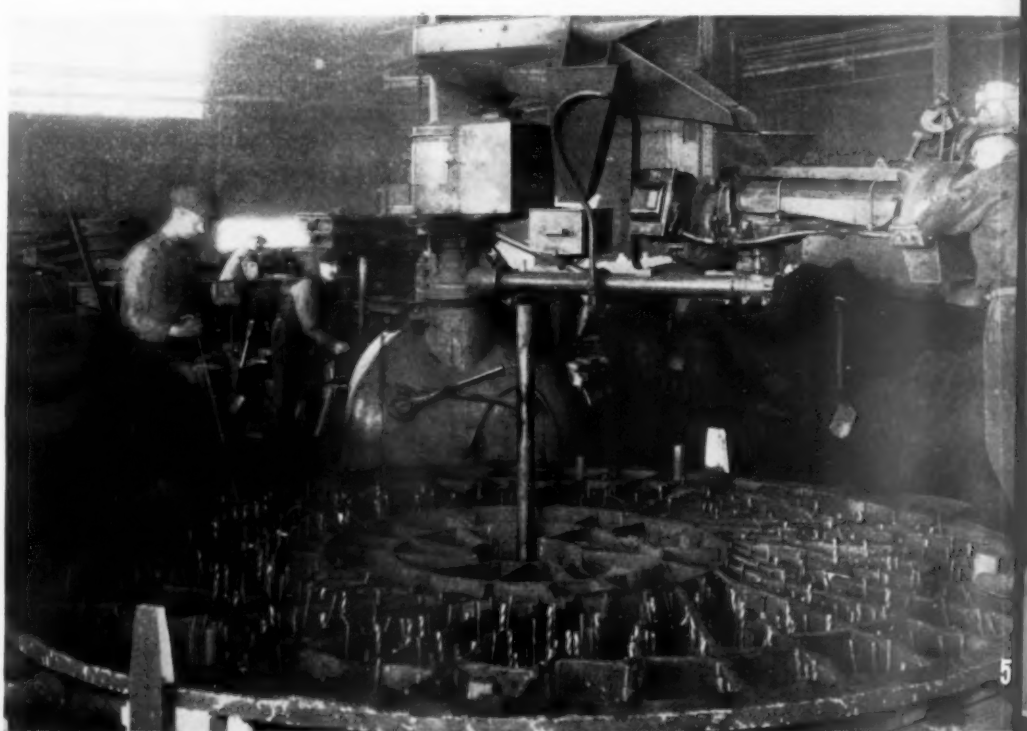
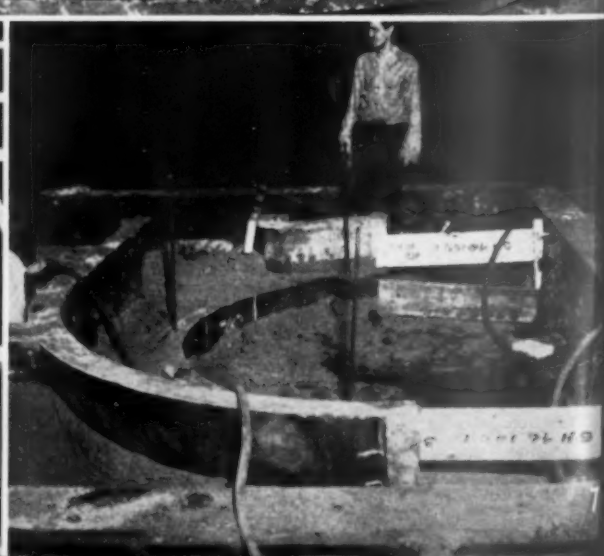


Fig. 5—Large barred cope flask with gaggers in place

Fig. 6 — Hand ramming a cement-bonded core in a skeleton box

Fig. 7 — Method of setting pattern in flask for bedding in



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GASES GIVEN OFF BY CORE

By HIRAM BROWN
Chief Metallurgist
Solar Aircraft Co.
Des Moines, Iowa

THE nature and amount of gas in molding materials is often the source of much conjecture with many foundrymen, and, unfortunately, often subject to many erroneous beliefs. There is no evidence to indicate that gas porosity results from core gases, providing the cores are thoroughly dried. Porosity tests have shown that pieces cast in dry sand molds are actually freer of gas porosity than similar metal cast in green sand molds. For example, in standard gas tests using increasing numbers to indicate amount of gas porosity, aluminum produced a porosity of No. 2 in dry core mold and a porosity of No. 10 when poured in regular green sand under otherwise similar conditions.

It is true, however, that blows and similar defects may be traced to cores, although proper venting would prevent much of that. The tendency of cores to cause blows is a function of four things: Amount of gas liberated by the core, rate of liberation of gas, permeability of the sand, and nature of the core gases. Permeability should be the maximum allowed for the surface appearance required. Core gases are organic and it is believed that such gases will not condense in the mold and, therefore, act as pressure raisers, whereas steam will condense on passing into the cool sand and will result in low pressure area which assists venting. There are two good precautions to observe in regard to cores. One is to obtain thorough baking, preferably a slight overbake, to diminish gas content of core. The other is to supply adequate venting even though the sand permeability is high. The remaining two factors of amount of gas and rate of liberation are discussed in this article.

Tests were made attempting to duplicate as near as possible actual foundry conditions. All mixes were used in ratio of 1-100 binder-sand ratio by weight. The baking time and temperature which produced peak strength for each binder was used for baking the core gas samples. (See "Comparative Strength and Hardness of Core Binders," THE FOUNDRY, October, 1948, page 76, for details of baking).

Standard ½-in. diameter stock cores were made from the respective mixes. After baking, the samples were cooled in a desiccator and allowed to remain there until used. For testing, a 25-gram piece of core was cut off and inserted in a section of round-bottom pipe. A threaded head was then fastened to the threaded end of the tube and sealed with white lead. A copper pipe was sealed to the top of the threaded head. These parts are shown in Fig. 20,

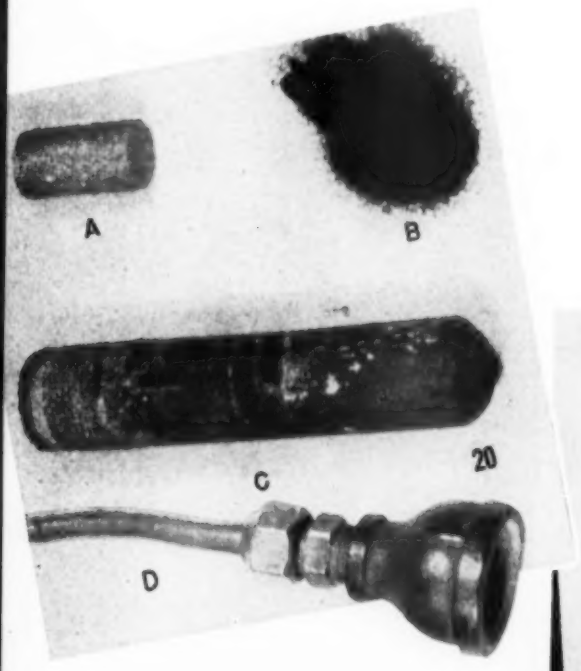


Fig. 20—(A) Sample core before testing. (B) Core residue after testing. (C) Round-bottom pipe into which core sample is placed. (D) Connecting link to testing apparatus

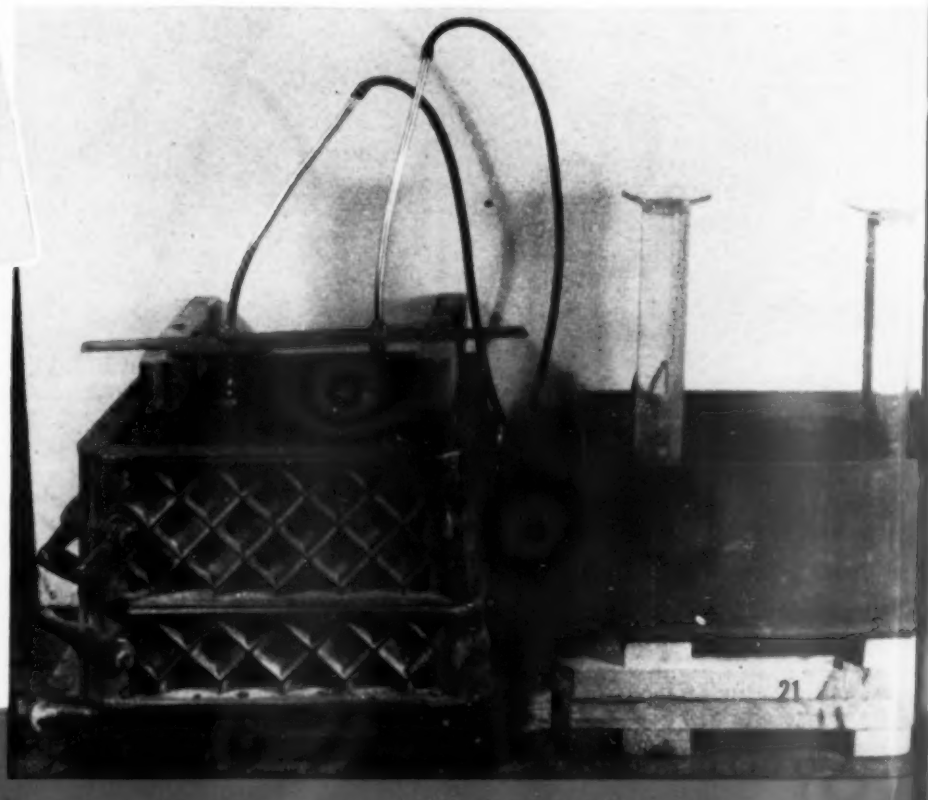


Fig. 21—Method of setting up testing apparatus

Fig. 22—Schematic drawing of assembled test apparatus

BINDERS

In this second and concluding article on properties of core binders, the author discusses the gases given off by various binders during baking and describes easily duplicated and practical tests to determine the most suitable binder for a given foundry and type of work

where *C* is the round-bottom pipe and *D* is the threaded head with copper pipe attached.

After the sample was in the tube and the unit sealed, the pipe containing the sample was placed in a green sand mold, as shown in Fig. 21, with 1-in. space all around the side and bottom of the pipe. Aluminum was then poured in the sprue hole and the pipe became a core entirely surrounded by metal. The gas driven off was collected over water by use of inverted graduates as shown in Fig. 21 and illustrated schematically in Fig. 22.

In the first trial tests one of the pipes shown in Fig. 22 contained a core sample and the other was a blank. Four or five trial runs were made, but in no case was any gas found in the graduate connected with the blank. Consequently the blank was discontinued and two different types of binders were run each time.

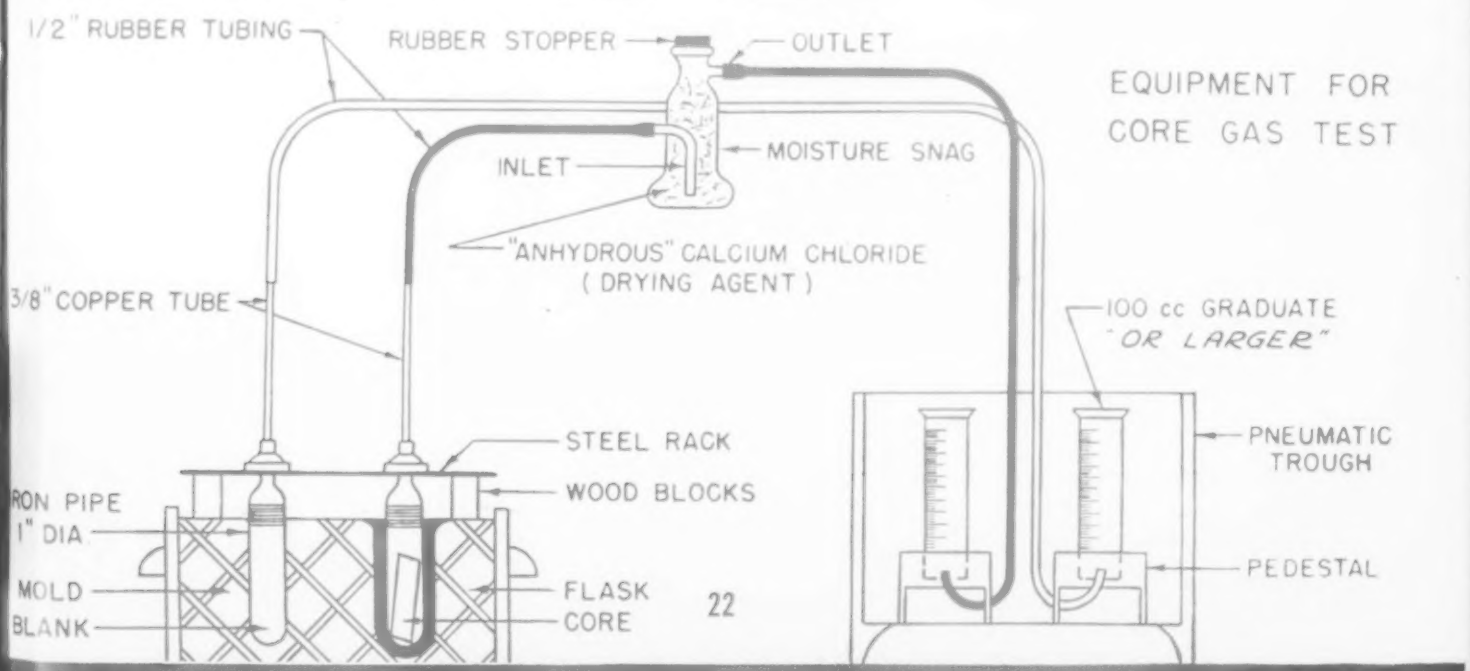
To make it easier to identify the binders Table I, which accompanied last month's article, is presented again.

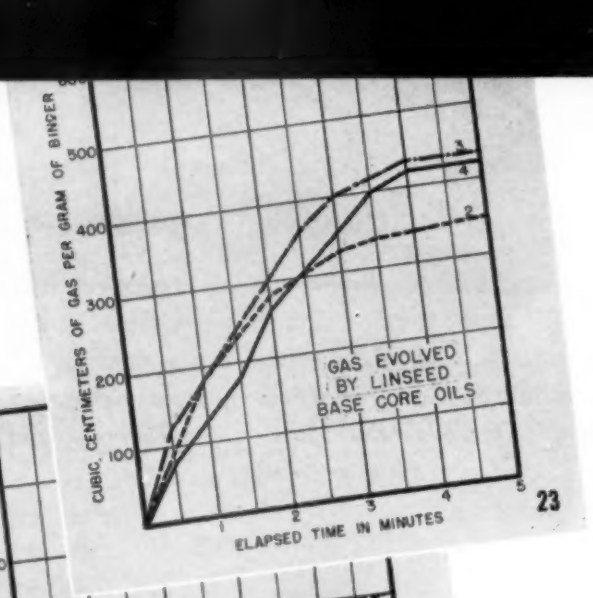
The first trial tests also utilized moisture snags in each line, as shown in Fig. 22, to collect any moisture. It was found after numerous tests that no moisture was evolved from the cores, indicating that they were thoroughly baked, so the water snags were not used in production.

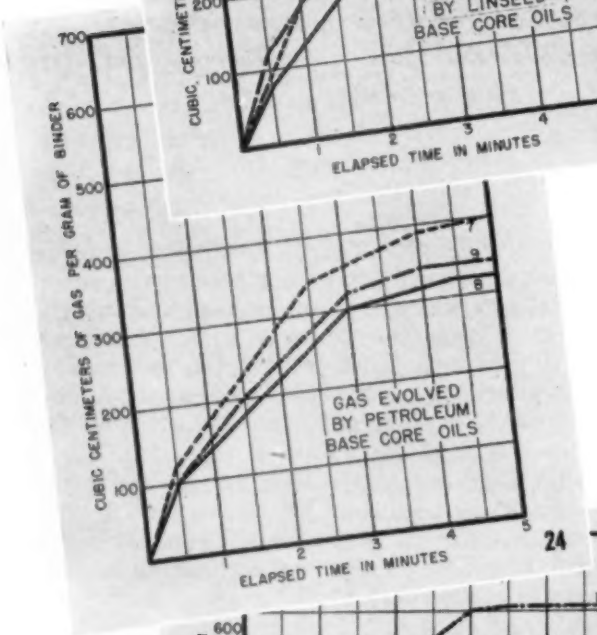
At least two samples of each binder were tested, and if total gas content values did not check within 10 per cent of each other the results were discarded and repeat tests made until uniform results were obtained. Usually it was found that large discrepancies occurred only if the tube and pipe were not properly sealed.

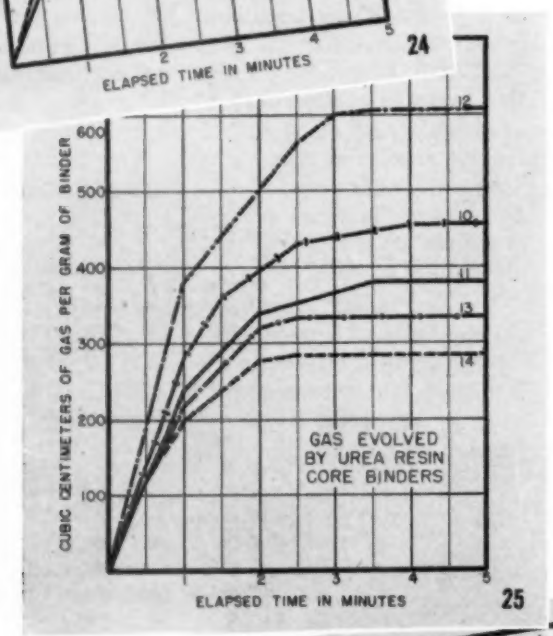
After the metal was poured, gas volume was measured every 30 seconds until all action ceased. The tubes remained in the metal until the metal froze. The tubes were then removed by submerging the entire mass in molten metal until the aluminum softened and could be shaken from the tubes. The core residue was then dumped out. The thorough breakdown of binder is indicated by the fact that this residue was a blackened sandpile with no strength. This is shown in Fig. 20B. The sample before testing is shown in Fig. 20A.

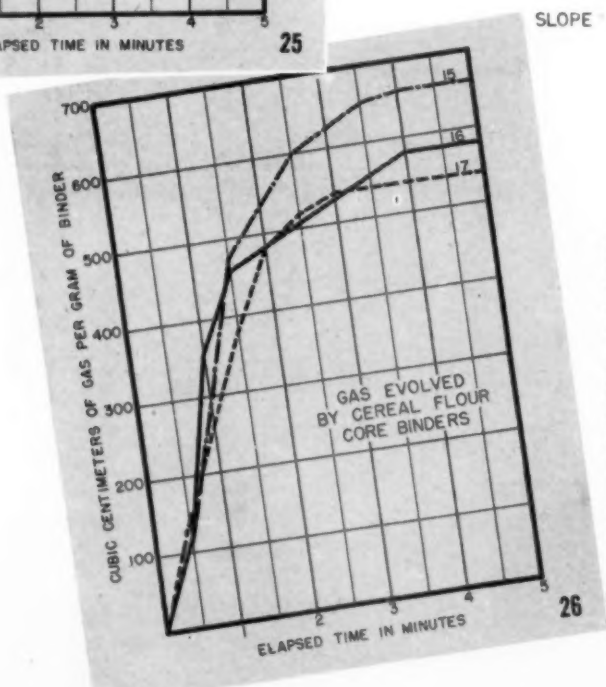
To determine what metal pouring temperature should be used, preliminary tests were run on one binder using temperatures of 1300 to 1600°F. Table V demonstrates that there was practically no difference in the total amount of gas evolved, nor was there any appreciable difference in the rate of gas evolution.









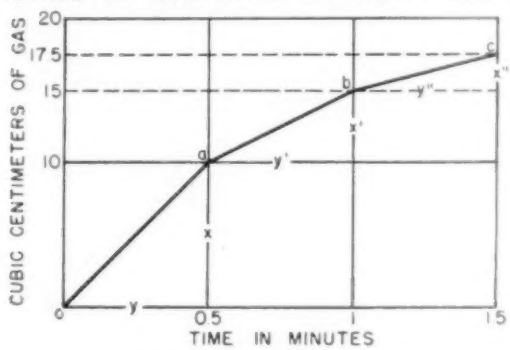


Figs. 23-26 — Charts showing amount of gas evolved by various types of core binders

A thermocouple was inserted in one tube and metal poured around the tube, using pouring temperatures of 1300 to 1600°F. Regardless of pouring temperature the temperature in the tube leveled off at approximately 1150°F and remained there until metal solidification set in. As pouring temperature increased, however, the initial temperature in the tube increased. Table VI shows the comparison of pouring temperature with temperature within the tube. This leveling off at about 1150°F may be due to the freezing of some constituent in the metal which creates a critical point in the cooling curve of the alloy. Once a skin of solid metal forms, the temperature reaching the tube is conducted from the next layer of freezing metal through the solid layer of the metal which has already formed. This will continue until the metal has all fairly well solidified.

Since no difference in total gas content could be found with increased pouring temperature, 1400°F was chosen as the pouring temperature for the tests. This is on the high side of what would usually be used in a foundry, so was thought to be a satisfactory choice. It seemed evident that 1150°F was sufficient to break down the cores rapidly since in only one case (1600°F) did the temperature in the

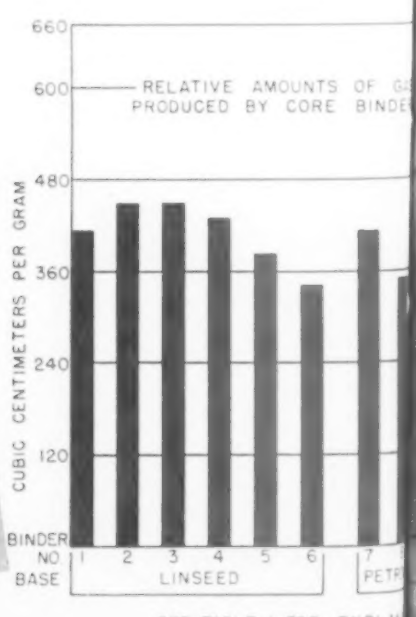
METHOD OF COMPUTING APPARENT SLOPES



$$\text{SLOPE OF } o\,a = \frac{x}{y} = \frac{10}{0.5} = 20$$

$$\text{SLOPE OF } a\,b = \frac{x'}{y'} = \frac{15-10}{1-0.5} = \frac{5}{0.5} = 10$$

$$\text{SLOPE OF } b\,c = \frac{x''}{y''} = \frac{17.5-15}{1.5-1} = \frac{2.5}{0.5} = 5$$



SEE TABLE I FOR EXPLA

tube exceed that, yet all of the cores were completely disintegrated when dumped out of the tube.

Gas Tests—The author realizes that there can be many objections to the method used to collect and measure core gas; however, this was not intended as a research tool, but to approximate foundry conditions using simple apparatus. Nevertheless, these facts should be remembered about the tests: (1) results could be closely duplicated time after time, (2) all bond was burned out of the cores as evidenced by the lack of strength when the residue was removed from the tube, and (3) all binders were subjected to the same condition during testing, so tests can be regarded as relative.

Total gas and rate of evolution were plotted for each binder. For graphing purposes the binders were grouped into four groups: (1) linseed base, (2) petroleum base, (3) urea resins, and (4) cereal flours.

Linseed Base Oils—Fig. 23 shows the gas curves typical of linseed base core oils. All of these oils agreed fairly closely in gas content since values for all six of them fell within the limits of the curves shown in Fig. 23. This is clearly shown, also, by the bar chart in Fig. 28.

Petroleum Base Oils—Fig. 24 shows gas curves for petroleum base core oils. The close agreement in results is evident here and in bar chart Fig. 28. The average volume of gas given off was less than that of the linseed base oils.

Urea Resins—Fig. 25 shows gas curves for urea resin binders. There was a wider spread between values in this group than in any of the other groups. Liquid urea resin (binder No. 14) gave the least amount of gas, which is to be expected from the fact that part of its original bulk consisted of water which was driven off in baking, thus leaving less effective binding material. Fig. 28 shows how this group compares with the others for total gas content.

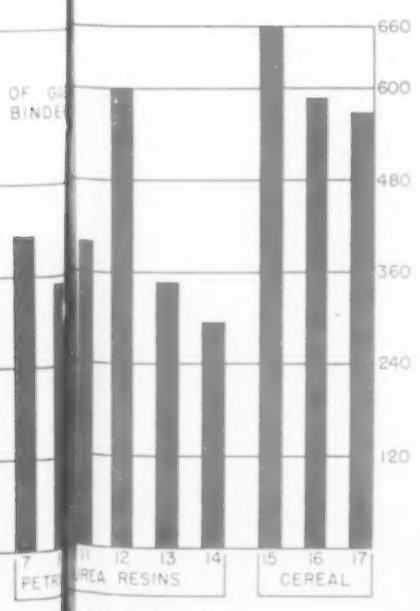
Cereal Flours—Fig. 26 shows gas curves for cereal flours. There was fairly close agreement in the total gas evolved by each. It can be seen, however, that as dextrinized starch content decreased so did gas content. Fig. 28 shows that this group of binders gave off more gas than did any of the other binders tested.

Rate of Gas Liberation—Not only the amount of gas, but the rate of its evolution is important. Gas given off while the metal is still molten enough to allow its escape will not cause trouble. Similarly, gas given off after the metal has solidified will not affect the metal. However, gas given off while the metal is in a mushy or semisolid state may cause blows. Also if the initial rate of breakdown is too fast the metal may be agitated so violently that blows will result. For cores not entirely surrounded by metal it may be very desirable to have rapid gas evolution as soon as the metal is poured. However, if the core is surrounded by metal—especially if the core is large and metal thickness small—such an action will result in such an accumulation of gas that the vents will not carry it away fast enough and the gas will remain trapped and cause blows.

In order to obtain some measurement of gas evolution a fairly simple mathematical method was used. The slope of any line is its rate of ascent, so that the faster gas is evolved the steeper the slope of the line drawn between readings taken at different time intervals. To apply this to Figs. 23, 24, 25 and 26 it is simply necessary to use cubic centimeters of gas for one value and divide this by the elapsed minutes. The result will be a number which, for practical purposes, can be called the "apparent slope" of the binder. The higher this value the faster the gas evolution. For example, if (*Please turn to page* 244)

TABLE I—*Binders Used in Experiments*

Number	Type
1	Linseed base with petroleum polymers, no thinner
2	Linseed base with petroleum polymers and thinner
3	Approx. 70% linseed, 15% rosin, 15% thinner
4	Pure linseed
5	Linseed base, petroleum polymer, rosin, and thinner
6	Linseed base, rosin and thinner
7	Petroleum base, resin, drying oil and thinner
8	Petroleum base, resin, drying oils
9	Petroleum base, fish oil, drying oils, rosin and thinner
10	Urea formaldehyde
11	Urea formaldehyde
12	Urea formaldehyde
13	Urea formaldehyde
14	Liquid solution of urea formaldehyde
15	Dextrinized corn starch
16	Half dextrinized, half gelatinized corn starch
17	50% dextrinized corn starch, 40% gelatinized corn starch, 10% rosin.



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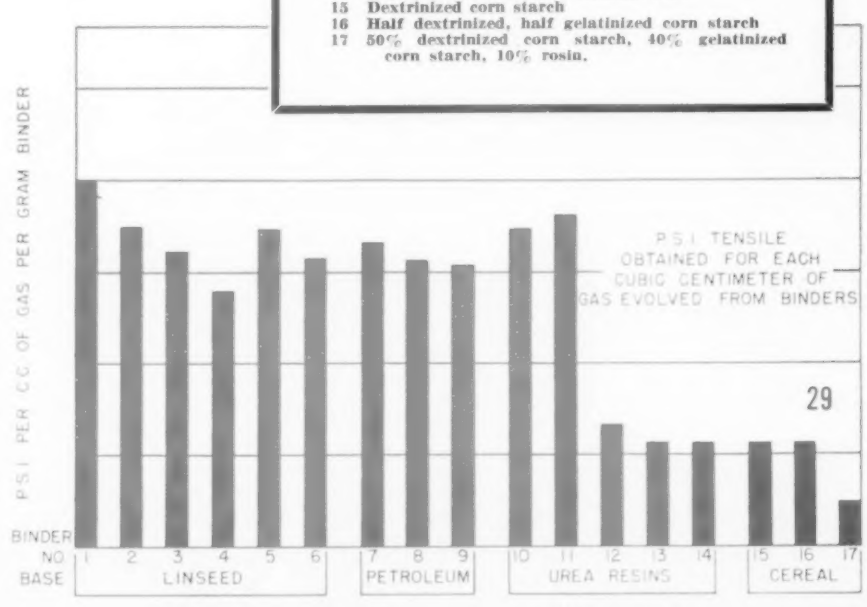

P.S.I. PER CC. OF GAS PER GRAM BINDER
P.S.I. TENSILE OBTAINED FOR EACH CUBIC CENTIMETER OF GAS EVOLVED FROM BINDERS
BINDER NO
BASE
1 2 3 4 5 6
LINSEED
7 8 9
PETROLEUM
10 11 12 13 14
UREA RESINS
15 16 17
CEREAL
SEE TABLE I FOR EXPLANATION OF BINDER NUMBERS

29

Above — Apparatus for measuring metal properties under elevated temperatures

Right — Metallographic samples can prove helpful in maintenance of quality control

Alloy Castings

Common defects encountered in aluminum alloy castings and methods of correcting them are discussed in this twelfth and concluding article of a series based on a survey sponsored by the Foundry Division of the Aluminum Association

By FLOYD A. LEWIS
Technical Consultant
Aluminum Association

MOST of the defects commonly found in the production of castings of other metals occur also in aluminum casting. Many of these defects are caused by improper melting and metal handling procedures, improperly tempered sand, or poor molding or coreroom practice. Defects most often encountered are: Dross and foreign inclusions; blowholes and entrained gas holes; shrinkage; porosity; cracks; misruns and coldshuts; and segregation.[4, 6] Their causes and most usual remedies are outlined in the following paragraphs.

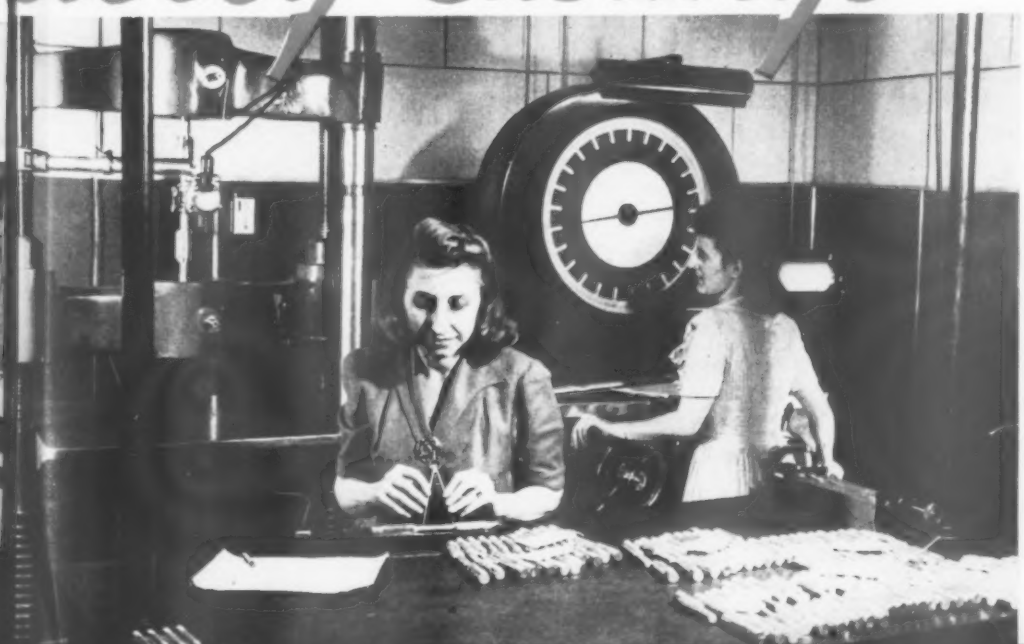
Dross and Foreign Inclusions—Dross and oxide inclusions may be either massive or three-dimensional inclusions or oxide film that may become entrapped in the body of the metal. The massive inclusions are particles of oxide either introduced with the original ingot or the remelt charge, or produced during the remelting and subsequent handling operations. Dross films are thin layers of oxide that form on the surface of the molten metal and later become enveloped in the body of the melt. Greater care in fluxing and skimming and avoidance of excessive agitation of the melt up to and including the pouring operation will largely overcome these difficulties. Holding the melt without agitation for a short time before pouring also is sometimes helpful.

Foreign inclusions are chunks or particles of miscellaneous materials that become entrapped in the body of the casting, sometimes pieces of refractory or core wire, but more often sand either abraded from the mold walls or chipped from a weak or protruding portion of the mold or core. General cleanliness about the foundry and the equipment coming into contact with the molten metal is an obvious remedy. Adequate sand control, careful handling of both the mold and cores, and proper ramming and gating techniques will minimize the possibility of sand inclusions.

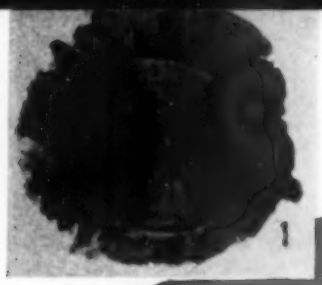
Blowholes and Gas Holes—Although somewhat similar in appearance, blowholes and entrained gas holes result from different causes and exhibit somewhat different behavior. Blowholes are mostly smooth-walled globular cavities caused by the localized generation of gas during solidification and appearing near the point of gas evolution. The gas is usually steam evolved from excessively damp sand, damp chill or insert surfaces, or inadequately dried core paste or wash. Volatile constituents in core binder also may be a source of gas. Proper tempering of molding sand, the use of sand having the proper permeability, properly vented cores, dry chills and inserts, and good core materials coupled with adequate baking of the cores will minimize the occurrence of blowholes.

Entrained gas holes are caused by bubbles of gas that, prior to solidification, had risen through the metal to regions near the cope surface or other surfaces of the casting to which the bubbles might adhere. They may be formed of gas mechanically entrapped as the metal swirled into the mold, or gas evolved upon contact of the molten metal with the mold or core materials. Some gas bubbles fail to penetrate the rather tenacious surface film of the metal and thus produce holes below the top surface of the casting. In other cases the bubbles may break through the surface of the metal; but if the mold permeability is such that the gas cannot escape, a rounded pit type of defect near the metal surface results.

Measures to reduce the occurrence of gas holes include changes in the gat- (*Please turn to page* 188)



Left — Checking test bar properties with tensile testing machine



NODULAR CAST IRONS

By H. MORROGH
and J. W. GRANT
British Cast Iron Research Association

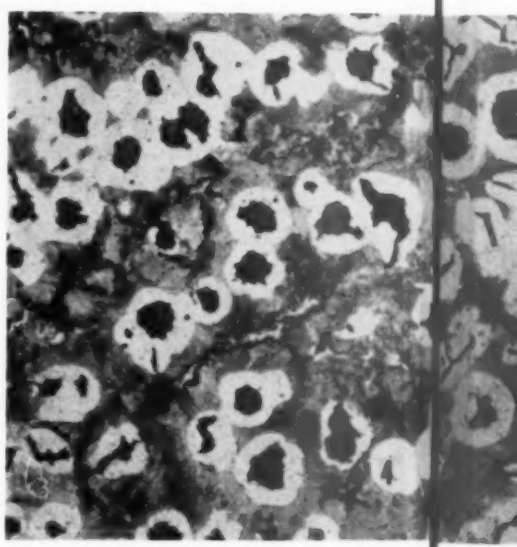
This is the first of two articles comprising a paper presented at the 45th Annual Conference of the Institute of British Foundrymen at London, June 8 to 11

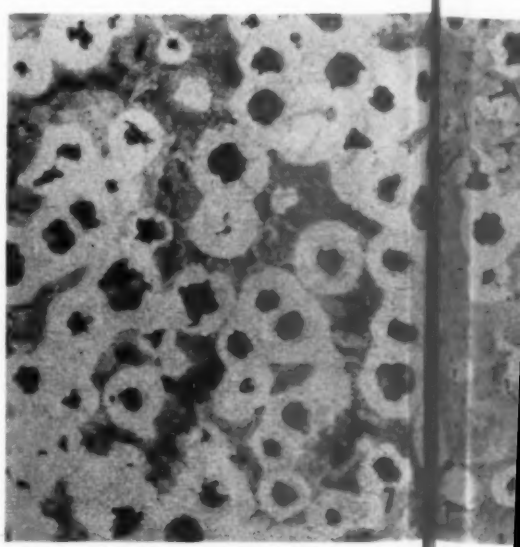
IT is well known that ordinary gray cast iron contains free carbon or graphite distributed through the metal in the form of flakes or lamellae. These graphite flakes severely limit the mechanical properties of the material, rendering it relatively brittle and non-ductile. In malleable cast iron, the free carbon exists in the form of temper carbon nodules which consist of approximately spheroidal aggregates of graphite. Graphite in the form of nodules does not appear to exert such a deleterious influence as when the same amount of graphite occurs in the form of flakes. These facts are well known and have been illustrated and discussed in the literature upon innumerable occasions. Furthermore, it has always been obvious that if cast iron could ever be produced with the graphitic carbon in the nodular form, an improvement in mechanical properties should result.

In the past the achievement of this ideal nodular structure in as-cast gray irons has not appeared to be possible, since nodular graphite was only produced by the heat-treatment of white cast iron according to the conventional malleablizing process. However, following a long-term investigation in the laboratories of the British Cast Iron Research Association, a patented process has recently been developed by which gray cast iron can be obtained, having all or part of the graphitic carbon content in the form of nodules in the as-cast state without the necessity for applying a subsequent heat-treatment for the purpose of obtaining that structure. Irons produced by this process, and having this structure in the as-cast state, have been termed "nodular cast irons."

Morrogh and Williams[1, 2] have given an account of the preliminary work leading up to the prediction of the possibility of producing nodular cast irons. More recently[3, 4] the same investigators have given accounts of the development of the process and of some of the theoretical considerations underlying it. It is the purpose of the present paper to give a detailed description of the mechanical properties of typical nodular irons and to discuss the commercial production of the material. Only a bare outline of the process will be given here, and for further details about the metallurgy of the process and the methods of investigation which have been used, attention is drawn to the other accounts, especially references[3] and[4]. For a full understanding of the process, consultation of these references will be necessary.

Stated in its simplest form, the process involves the solution





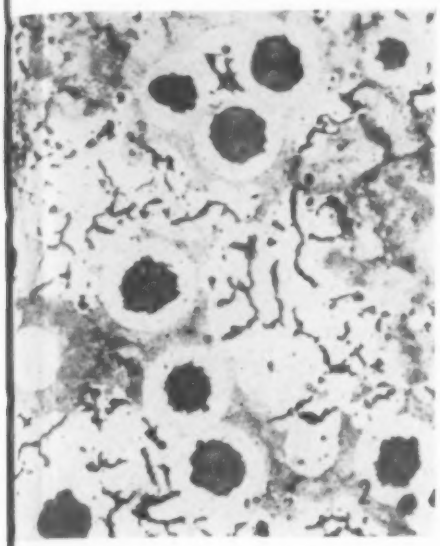


Fig. 1—Duplex structure of hypereutectic nodule. Unetched. 1500 X

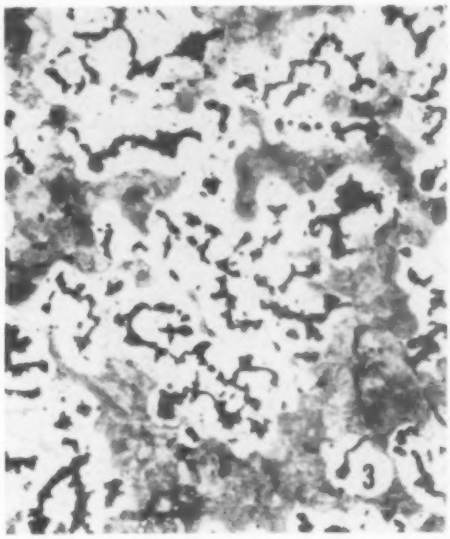


Fig. 2 — General structure of cerium treated hypereutectic cast iron. Etched in picric acid. 100 X

Fig. 3—Quasi-flake graphite in single treated nodular iron. Etched in picric acid. 100 X

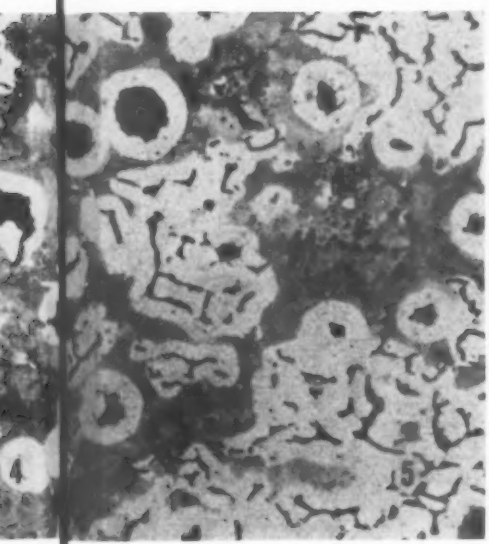


Fig. 4 — Nodular structure in double treated nodular iron. Etched in picric acid. 100 X

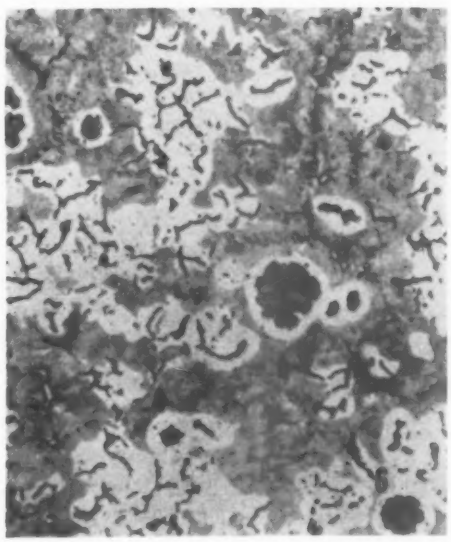


Fig. 5 — General structure of 1.2-in. bar V.835. Etched in picric acid. 100 X

Fig. 6 — General structure of 1.2-in. bar V.980. Etched in picric acid. 100 X

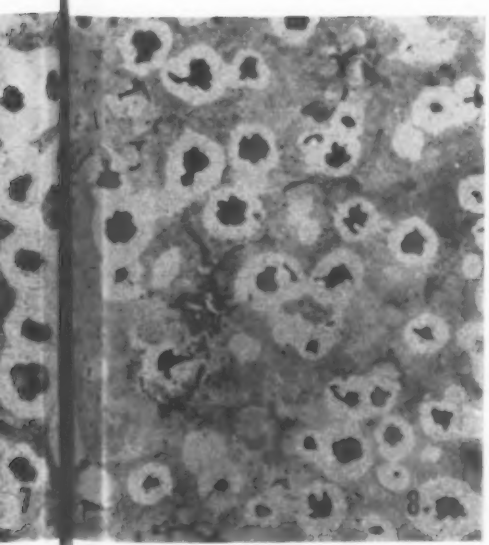


Fig. 7 — General structure of 1.6-in. bar V.895. Etched in picric acid. 100 X

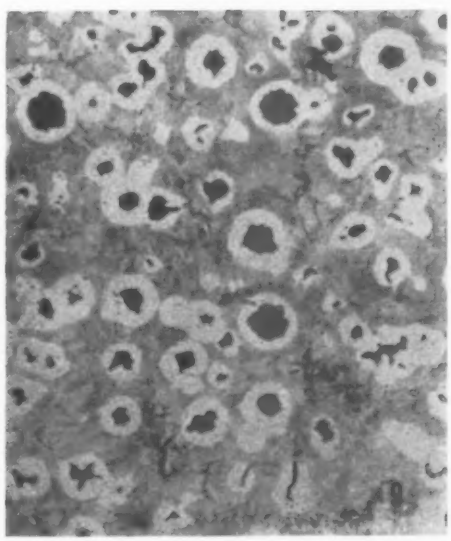


Fig. 8 — General structure of 1.2-in. bar V.895. Etched in picric acid. 100 X

Fig. 9 — General structure of 0.875-in. bar V.895. Etched in picric acid. 100 X

of a appropriate amount of cerium in molten cast iron of appropriate composition shortly before casting. The principal composition requirements for the iron to be treated with cerium are:

(1) The iron must solidify gray even without the cerium addition.

(2) The iron must be of hypereutectic carbon content, that is, the carbon content should exceed the value

$$4.3 - 1/3\ (\text{Si per cent} + \text{P per cent}).$$

When the nickel content of an iron exceeds 10 per cent, it need not be hypereutectic according to this formula.

(3) The silicon content can have any value, but is preferably within the range 2.3 to 7 per cent.

(4) The sulphur content of the metal to be treated should be as low as possible and after treatment it should not exceed 0.02 per cent.

(5) The phosphorus content must not exceed about 0.6 per cent and should preferably be below 0.1 per cent.

(6) Manganese, copper, nickel, chromium and molybdenum may be present in any amounts singly or in any combination, provided condition No. 1 is observed.

The most important of the above requirements are those covering carbon and sulphur contents. After treatment with cerium the solidified castings must contain more than 0.02 per cent of this element.

First and foremost, cerium combines with sulphur in cast iron and is a very effective desulphurizer. Cerium itself will not alloy with cast iron until the sulphur content has been reduced below about 0.02 per cent. When cerium is added to molten cast iron containing sulphur in excess of this figure it immediately combines with the excess sulphur to give a cerium-sulphur compound which is relatively insoluble in molten cast iron and floats to the surface of the metal.

This desulphurizing reaction is very rapid; for instance, the sulphur content of 5 cwt. of molten metal may be reduced from 0.06 per cent to below 0.02 per

TABLE I.—Influence of Cerium on Remelted Hematite Pig Iron

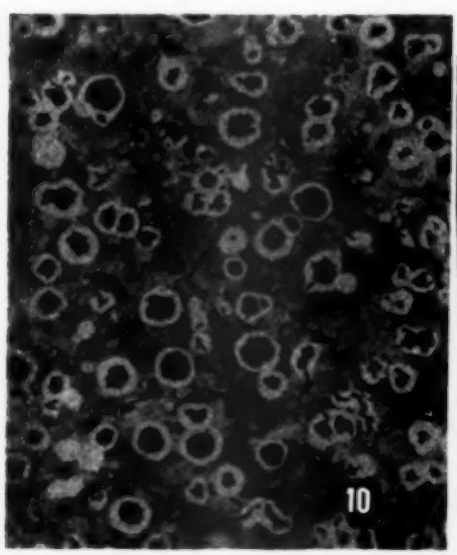
Diam of test bars, In.	Transverse rup. stress, Tons per sq in.		—Deflection, In.—		Tensile strength, Tons per sq in.		Brinell hardness number		Impact, Ft-lb	
	Without Ce.	With Ce.	Without Ce.	With Ce.	Without Ce.	With Ce.	Without Ce.	With Ce.	Without Ce.	With Ce.
1.6	23.0	44.2	0.20	0.32	11.2	24.2	154	186	..	..
1.2	28.8	45.3	0.28	0.38	14.3	24.6	160	198	..	..
0.875	30.7	47.1	0.18	0.23	16.6	26.6	162	199	12	43
0.6	30.8	57.4	0.11	0.22	18.6	29.5	198	239	..	..

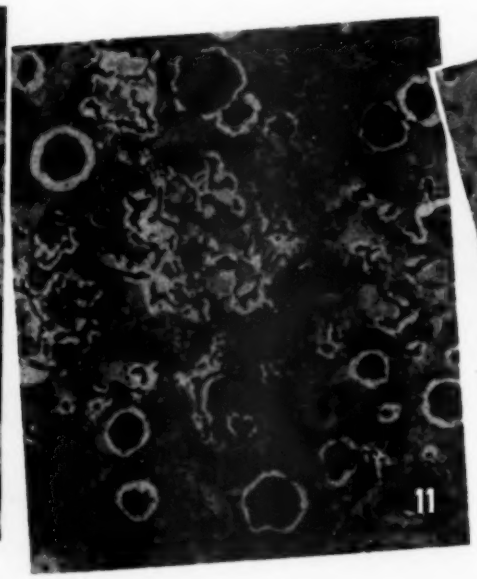
TABLE II.—Influence of Double Treatment. Ce + Inoculant

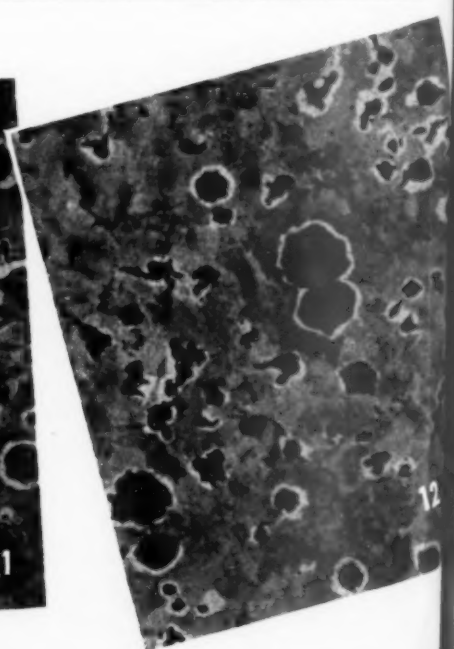
No.	T.C.	Si.	Mn.	S.	P.	Ce.	Transverse rup. stress, Tons/sq in.	Deflection, In.	Tensile strength, Tons/sq in.	Bhn	Impact, Ft-lb
1	3.67	2.67	0.86	0.005	0.051	0.040	56.9	0.60	26.0	221	54
2	3.49	2.89	0.88	0.008	0.055	0.058	62.0	0.60	33.4	238	84

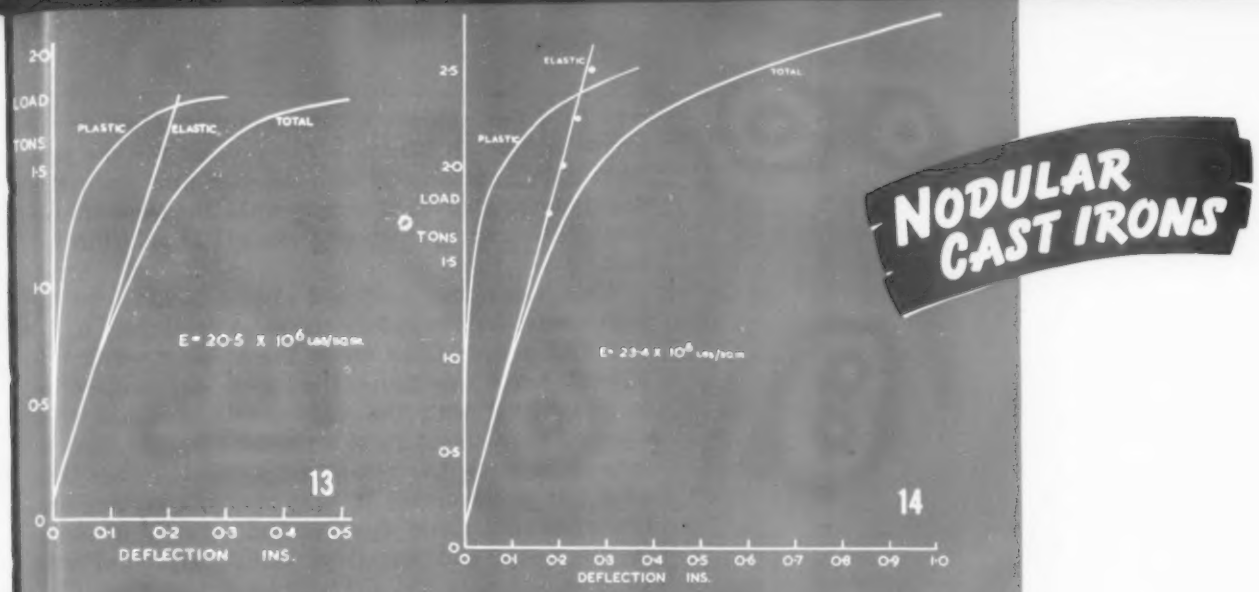
TABLE III.—Key to Melt Numbers, Raw Materials and Chemical Composition

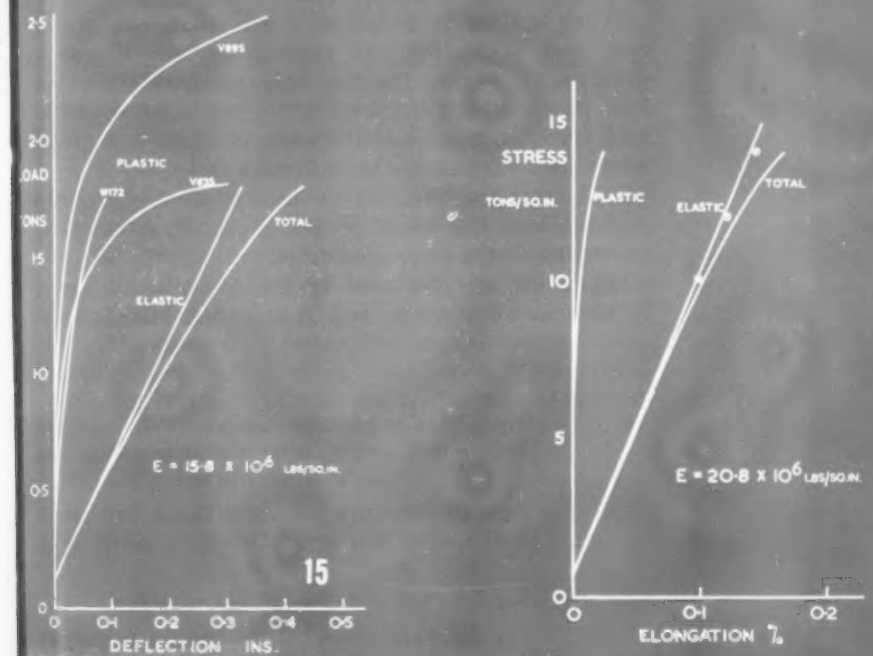
Melt No.	Treatment and Additions	T.C, per cent	Si, per cent	Mn, per cent	S, per cent	P, per cent	Ce, per cent	Cu, per cent	Remarks
V.835 Pig A	Single. 70 gm. *mischmetall* to 65 lb. tap	3.74	2.65	0.53	0.006	0.024	0.053	...	White in 0.875 in. and 0.6 in. bars.
V.980 Pig B	Single. 35 gm. *mischmetall* to 70 lb. tap	3.76	2.48	0.85	0.012	0.051	0.029	...	White in 0.6 in. bars.
V.895 Pig B	Double. 70 gm. *mischmetall* to 65 lb. tap. 6½ oz. S.M.Z.	3.55	3.01	0.89	0.004	0.044	0.053	...	
W.3 Pig C	Double. 90 gm. *mischmetall* to 70 lb. tap. 10 oz. S.M.Z.	3.60	2.33	0.84	0.011	0.044	0.045	2.19	
W.30 Pig C	Double. 110 gm. *mischmetall* to 70 lb. tap. 10 oz. S.M.Z.	3.68	2.34	0.77	0.009	0.035	0.054	1.49	

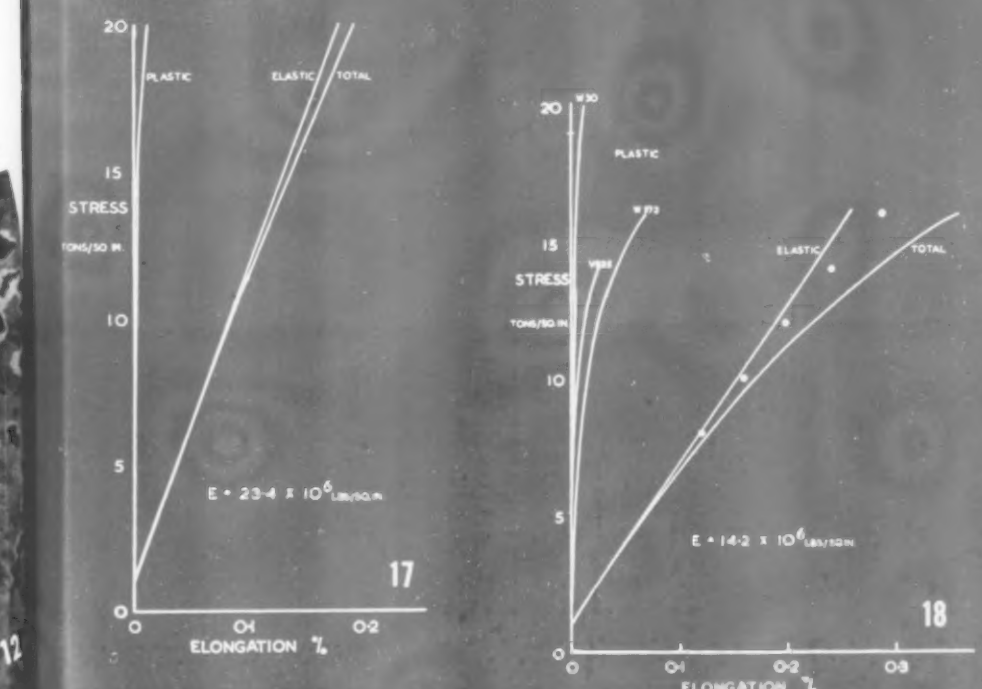












NODULAR CAST IRONS

Fig. 10—General structure of 0.6-in. bar V.895. Etched in picric acid. 100 X

Fig. 11—General structure of 1.2-in. bar W.3. Etched in picric acid. 100 X

Fig. 12—General structure of 1.2-in. bar W.30. Etched in picric acid. 100 X

Fig. 13—Transverse set and deflection curves for 1.2-in. diam bar V.835

Fig. 14—Transverse set and deflection curves for 1.2-in. diam bar V.895

Fig. 15—Transverse set and deflection curves for flake graphite iron W.172

Fig. 16—Tensile set and extension curves for bar V.835

Fig. 17—Tensile set and extension curves for bar W.30

Fig. 18—Tensile set and extension curves for flake graphite 1.2-in. diam bar W.172

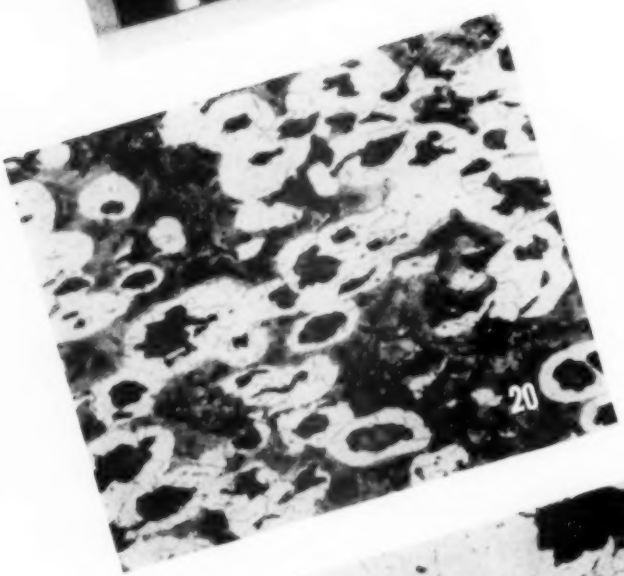
NODULAR CAST IRONS

cent in a few seconds by the addition of an appropriate amount of cerium. The process for the production of nodular cast iron depends first upon this desulphurizing effect of cerium when the sulphur content of the iron to be treated exceeds about 0.015 per cent.

When more than sufficient cerium is added to the molten cast iron to reduce the sulphur content to below 0.02 per cent, or when the sulphur content is initially below this figure, the excess cerium dissolves in and alloys with the molten cast iron and then exerts a pronounced carbide-stabilizing effect, that is, it tends to cause the iron to solidfy white rather than gray. It is important to note that the carbide stabilization only arises from cerium actually dissolved in the metal and not from cerium combined with sulphur.

When cerium is added to a molten hypereutectic cast iron of appropriate composition (as described previously), so that the final sulphur content is below 0.02 per cent and the cerium content is in excess of 0.02 per cent, but below the amount which will give a white iron casting, on solidification it causes the hypereutectic graphite, which is deposited from the liquid before the metal proper begins to solidify, to crystallize in the form of nodules.

When the metallic part of the cast iron solidifies, it does so as a white cast iron giving the familiar



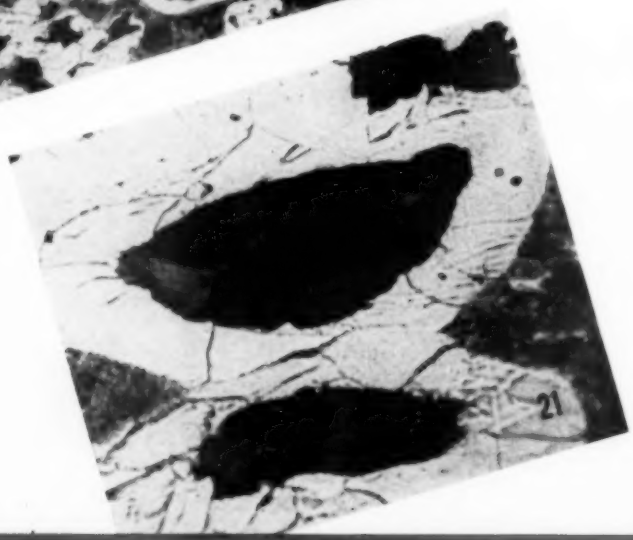


Fig. 19—Compression testpiece V.980; Left before test; center, after plastic straining, and right after fracture

Fig. 20—Structure of compression test piece V.895 after fracture. Etched in picric acid. 100 X

Fig. 21—Same as Fig. 20 but at 500 X

Fig. 22—Load-compression curve for bar V.895

Fig. 23—Compression stress-strain curves for 1.2-in. diam bar V.835

Fig. 24—Torsion test piece

Fig. 25—Set and twist curves for bar V.895

Fig. 26—Torque-twist curves for bars V.835 and V.895

Fig. 27—Reversed torsion hysteresis curve for V.895

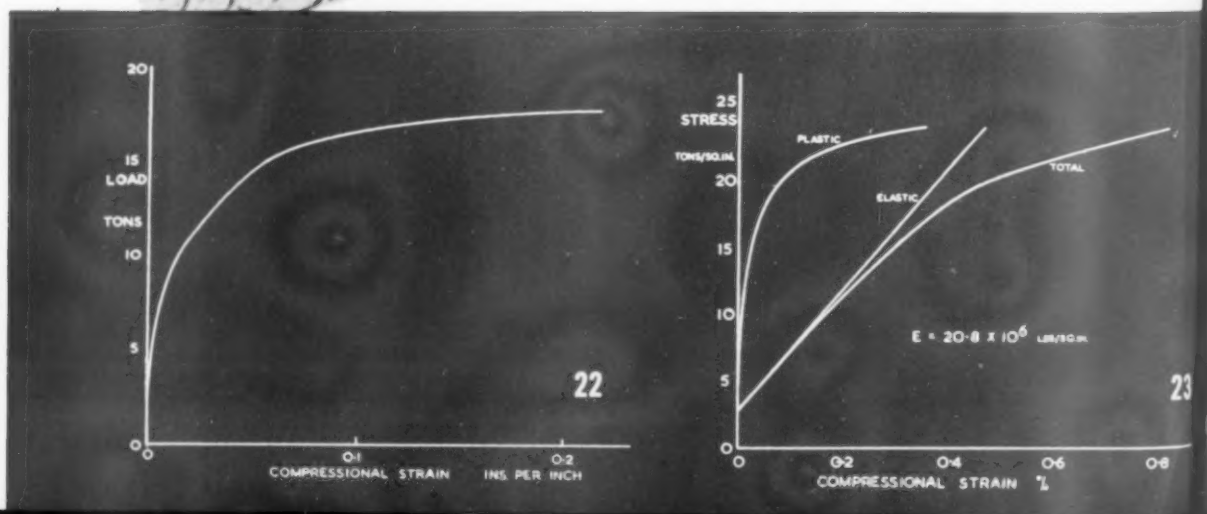


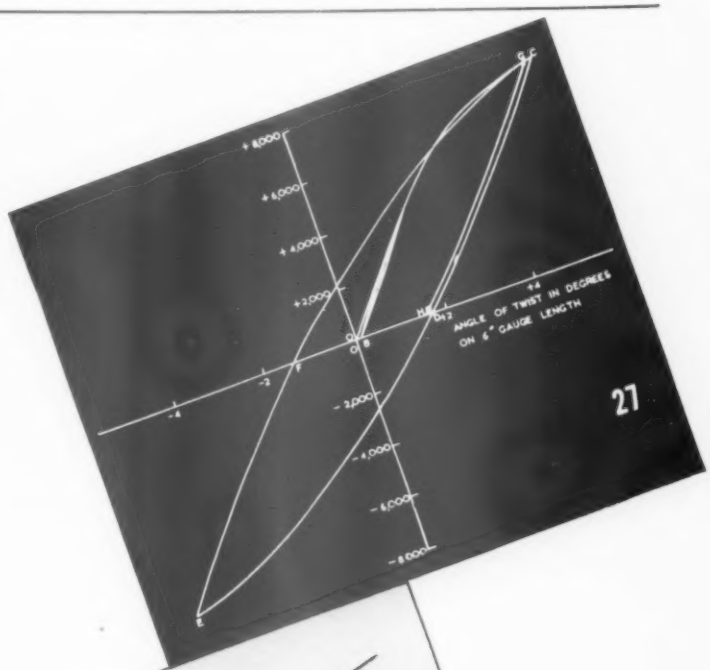
TABLE IV.—Mechanical Test Results on Five Samples of Nodular Cast Irons

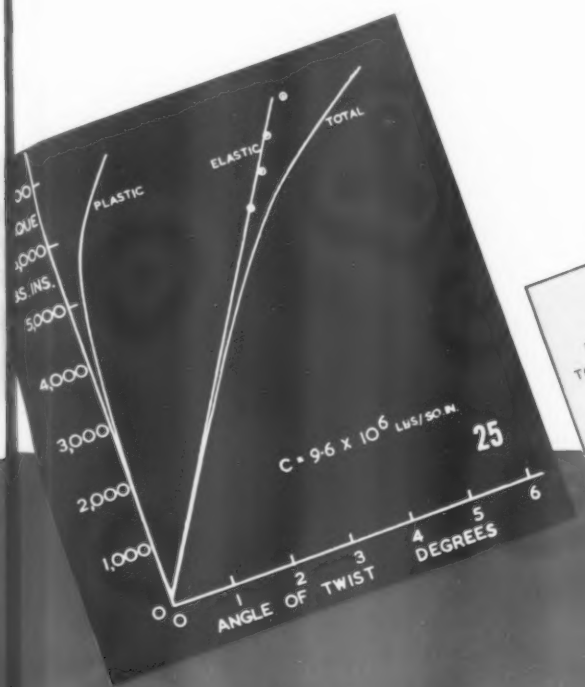
Melt No.	Diam As-cast, In.	Transverse As-cast. Trans. rup. stress, Tons/sq in.	Deflection, In.	Mod. of elasticity, × 10⁶, psi	Transverse Machined. Trans. rup. stress, Tons/sq in.	Deflection, In.	Mod. of elasticity, × 10⁶, psi	Tensile. Ult. tensile stress, Tons/sq in.	Mod. of elasticity, × 10⁶, psi	Ratio, Trans. Tens.	Bhn	Impact, 0.798 in. diam, ft-lb	Compression. Ult. compression stress, T./sq in.	Mod. of elasticity, × 10⁶, psi
V.835	1.6	40.7	0.34	18.2	45.0	0.43	18.9	23.0	19.4	1.8	178	48 51	54.4	
	1.2	48.6	0.54	20.5	47.1	0.57	20.0	25.6	20.8	1.9	187	32 51	76.0	20.8
	0.875													
	0.6					All 0.875-in. and 0.6-in. diameter bars were white								
V.880	1.6	48.5	0.47	19.4	47.2	0.59	19.0	22.4	20.2	2.2	178	51 33	54.8	
	1.2	48.1	0.48	20.8	51.4	0.88	20.8	24.0	20.2	2.0	184	75 110	62.0	21.3
	0.875	64.2	0.38	22.2	55.7	0.51	21.8	25.4	19.1	2.5	204		56.4	
	0.6					All 0.6-in. diameter bars were white								
V.895	1.6	61.6	0.52	22.0	63.2	0.63	21.6	28.8	23.8	2.1	213	78 62	71.6	
	1.2	70.2	1.03	23.4	69.6	0.95	23.4	30.6	24.1	2.3	230	55 59	66.0	23.6
	0.875	73.4	0.44	24.9	63.2	0.29	25.0	35.2	24.0	2.1	249	109>120	72.4	
	0.6	77.6	0.36	21.9	80.2	0.36	22.8	34.8	21.4	2.2	272		70.0	
W.3	1.6	65.4	0.33	22.1	69.4	0.45	21.4	37.2	22.8	1.8	258	78 55	74.8	
	1.2	72.9	0.50	23.3	77.8	0.70	22.4	38.0	22.1	1.9	272	100 100	75.2	23.5
	0.875	73.8	0.26	24.0	79.2	0.32	22.1	38.2	22.8	1.9	290	106>120	67.2	
	0.6	77.0	0.18	24.7	80.8	0.23	23.3	38.6	23.4	2.0	313		93.6	
W.30	1.6	68.4	0.42	22.1	73.8	0.58	22.1	34.2	24.2	2.0	262	110		
	1.2	71.9	0.54	22.8	64.0	0.42	23.1	37.8	23.4	1.9	271	55 73	66.4	23.8
	0.875	82.7	0.37	26.0	73.2	0.28	23.1	38.0	24.4	2.2	290	56 72	78.2	
	0.6	93.6	0.37	24.3	90.0	0.28	23.9	36.6*	23.4	2.6	307		84.0	

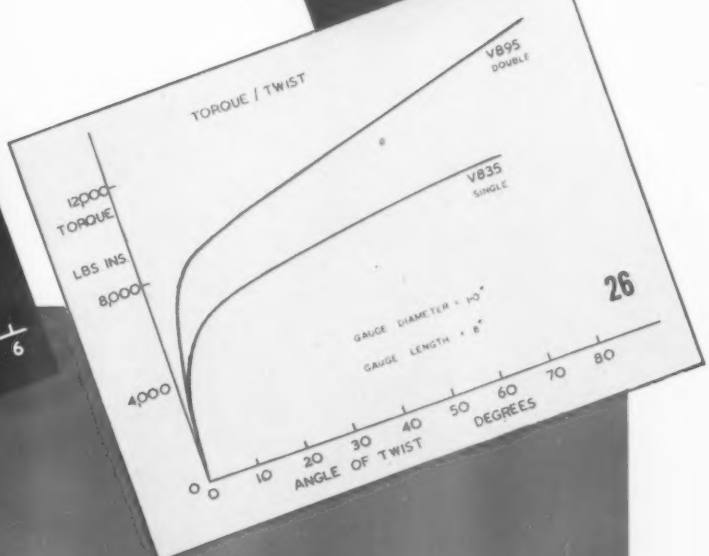
* Fracture showed inverse chill.

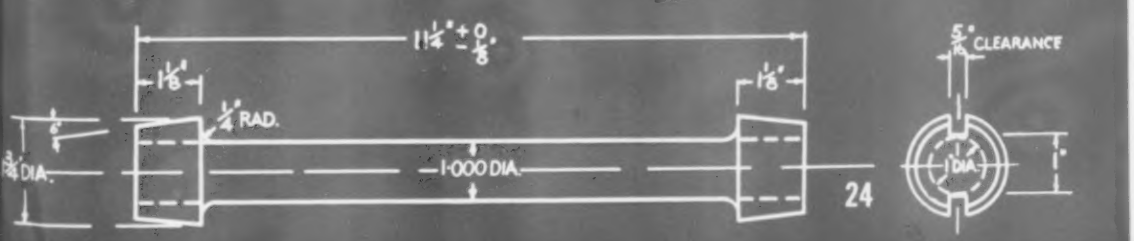
white iron eutectic containing cementite (iron carbide) so that immediately after solidification there exist nodules of hypereutectic graphite distributed through a white iron structure. Due partly to the inoculating effect of the hypereutectic graphite nodules, the cementite of the white iron begins to decompose shortly after solidification to give more graphite.

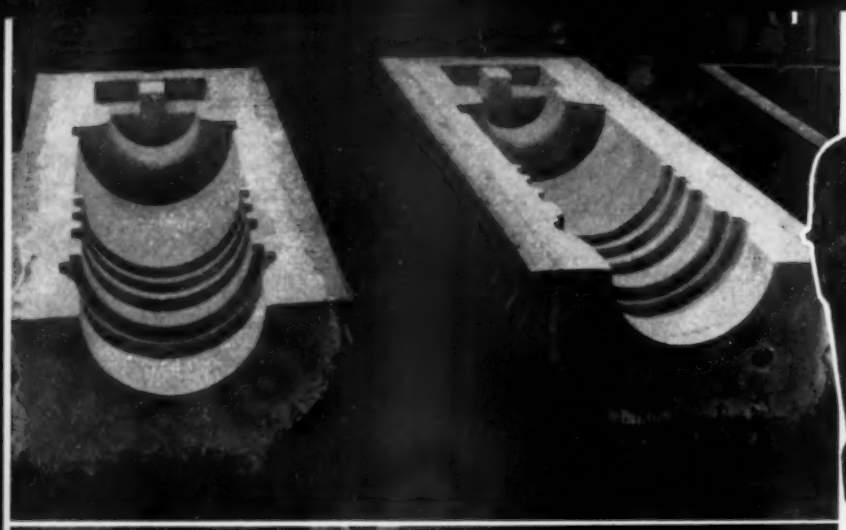
At this stage it is convenient to consider a typical example of the effect of cerium upon a hypereutectic cast iron. Fifty lb of a hematite pig iron of the following composition: T.C. (*Please turn to page* 170)











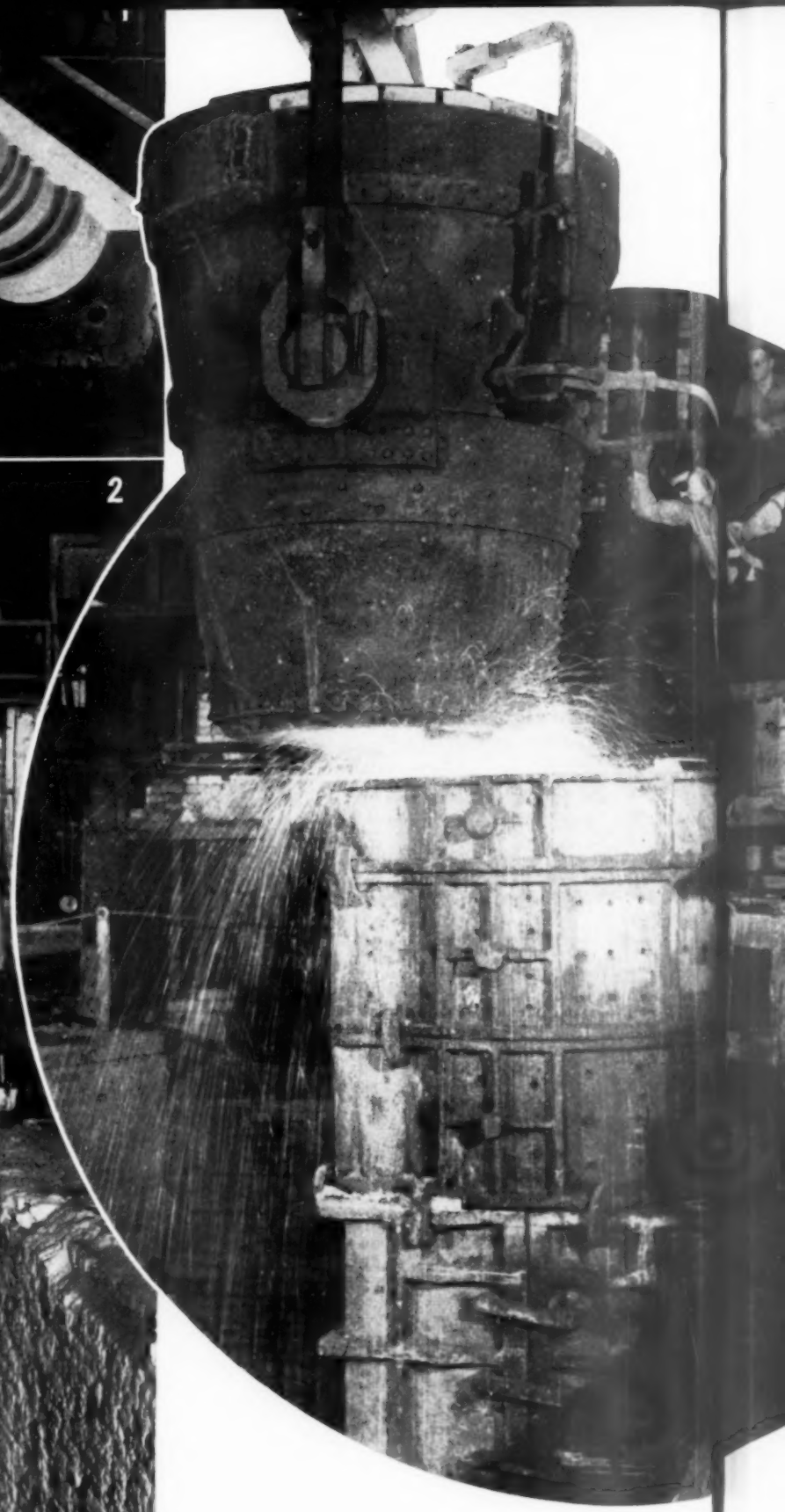


Fig. 1—Two halves of a mold for a large steel roll. Iron half rings serve as chills

Fig. 2—For convenience in pouring, the clamped flask is turned up on end and lowered into a pit

Casting Steel and Iron Rolls

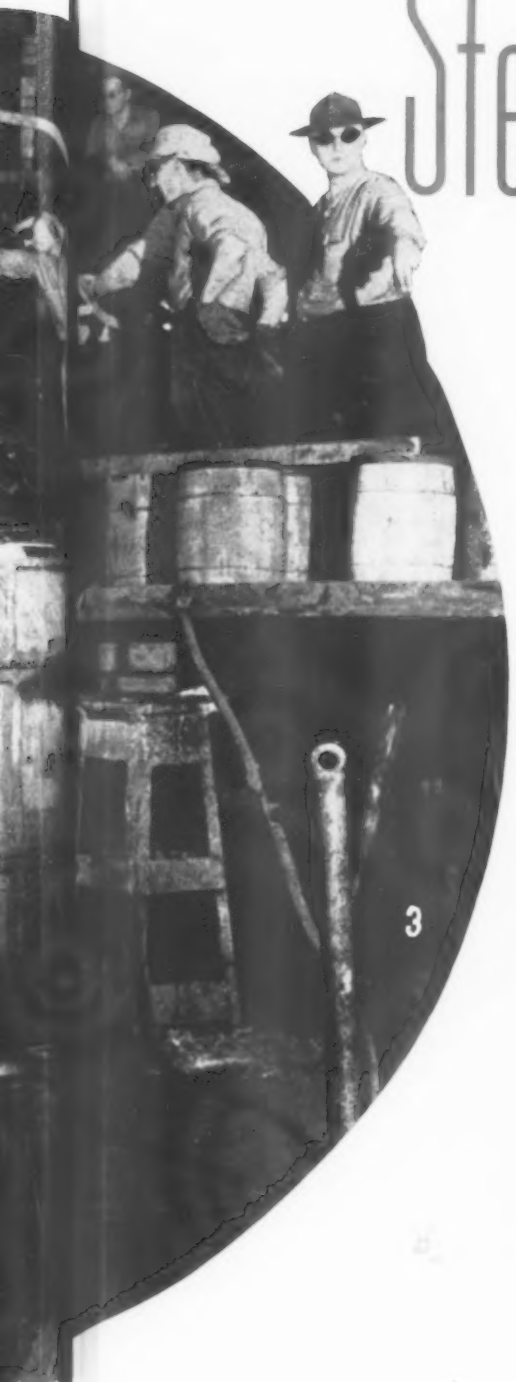


Fig. 3—Pouring a large roll. Sink head for large rolls is formed in a separate flask and placed on top of the mold

WITH a continuous record of achievement over a period of 144 years the Mackintosh-Hemphill Co., Pittsburgh, has played an important part in the growth and progress of the iron and steel industry in the United States. Iron guns and solid shot in gradually increasing size and weight formed an important part of the company's products until the early eighties, when ordnance engineers decided that the practical limitations of gray iron had been reached. Attention was turned to the use of steel in the manufacture of big guns. One of the largest of the big cast iron guns cast in 1864 was 20-in. diameter and 210-in. in length.

Following the close of the Civil War, the opening up and settlement of the West, expansion of the railroads and the mutitudinous industrial activities incident to supplying the needs of a rapidly growing population, the company turned its attention more particularly to the production of rolling mills and rolling mill accessories. Castings in that field had formed part of the product of the company for many years. In a list of *Firsts* published several years ago, claim is advanced for the first chilled roll cast west of the Allegheny mountains. Since no record is available for priority east of the Alleghenies it is reasonable to assume that this roll cast in 1823 was the first cast in the United States. The first chill roll patent in the name of James Harley was issued in 1835. The bottom whirling gate, still recognized as standard practice, is one of the items in the patent. The company made its first steel castings in 1885 and in 1888 built two 58-in. roll lathes for finishing the products of its own steel foundry.

Built Reversing Blooming Mill

When Carnegie set his brood of industrial young steel giants to the task of flooding the country with steel, the company was in position to design and manufacture the necessary equipment. Reversing mills had been made before, but had been failures. Mr. Hemphill forced the massive reversing blooming mill to the front. Homestead, one of the greatest American steel plants was conceived, designed, constructed and equipped by James Hemphill. He turned it over to Andrew Carnegie with the laconic comment: "There it is Andrew. Take it. A mill without a rival in the world today."

In addition to equipping the majority of mills in the United States, the company has built mills for many foreign steel plants. The record shows a complete mill produced every 34 days for a period extending back to 1868.

The present company represents a merger of the A. Garrison Foundry Co., Pittsburgh Iron & Steel Foundries Co., and Woodward Machine Co., Wooster, O., with the original Mackintosh-Hemphill Co., Pittsburgh. Miscellaneous iron castings and iron rolls are made in the Pittsburgh plant. Alloy iron and steel castings and rolls are made at an extensive plant in Midland, Pa. The accompanying illustrations show how the roll castings are made.

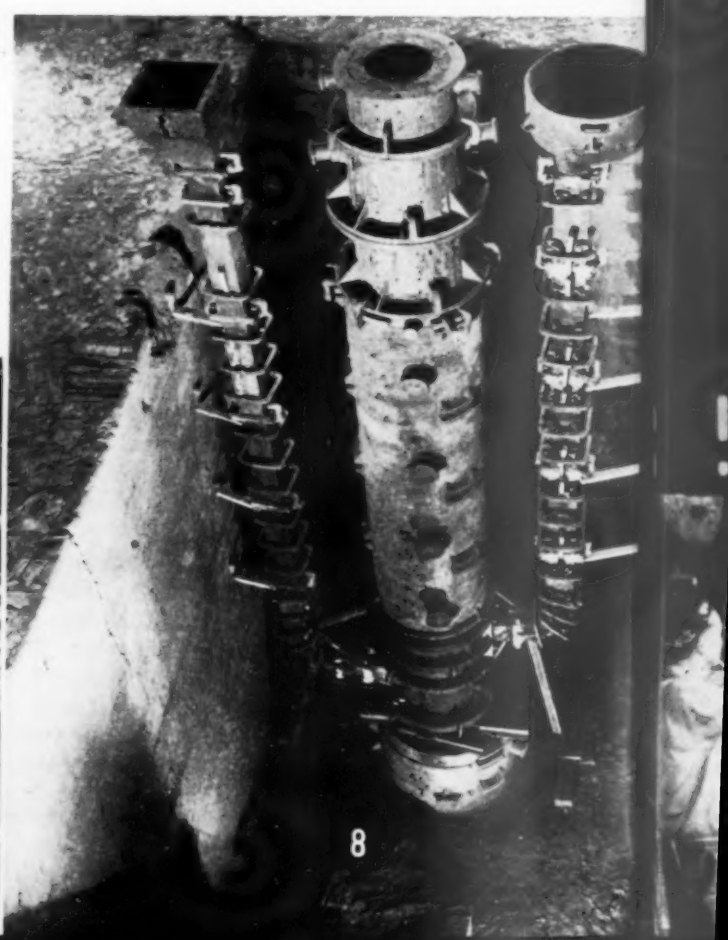
Fig. 1 shows the two halves of a mold for a large steel roll. The

sand ridges are formed around half rings that serve as chills to improve the grain structure of the roll. Sand is rammed in the flasks to approximately the proper shape, and then brought to the exact shape by a sweep attached to a long spindle resting on suitable bearings in the flask ends. Sand surface in the lower neck and wabbler is reinforced with nails. After the face of the mold is coated with a wash made up of silica flour, water and a binding agent, the two half molds are dried in an oven. Later they are removed, clamped together, turned up on end as in Fig. 2 and lowered into a pit for convenience in pouring. Two sprues leading to whirl gates near the bottom of the mold are shown to the right in Fig. 1. On large molds the sink head is formed in a separate flask and placed on top of the mold. The sink head supplies metal to compensate for the shrinkage of the casting as its passes from the liquid to the solid state.

Method of charging the open-hearth furnace is shown in Fig. 5. Out in the stock yard pig iron and scrap are loaded in containers mounted on buggies. In front of the furnace each container is picked up by the charging machine, inserted through the open door and turned over. When the heat is almost ready to tap, small amounts of metal are taken out in a long handle steel spoon and poured into test molds. The skilled melter notes the temperature by pyrometer. The test block is broken and the melter reads the fracture. When his visual and accurate opinion of the composition is confirmed by a report from the quick test laboratory, the heat is tapped from the furnace. In some instances a spoonful of metal is spilled on a clean steel plate. The smaller particles are crushed and the powder is analyzed.

When the steel in the furnace has been brought to the desired composition and temperature, the furnace tap hole is opened and the steel flows into a waiting ladle. A powerful crane carries the ladle to a point where the contents are poured into a mold as in Fig. 3.

A large roll, such as shown in Fig. 4, may remain in the mold a week before it is removed to the cleaning department. The cleaned roll is placed in an annealing oven where the temperature is regulated in accordance with the composition. After cooling the roll is rough machined and returned to the annealing oven for a second heat (*Please turn to page* 199)



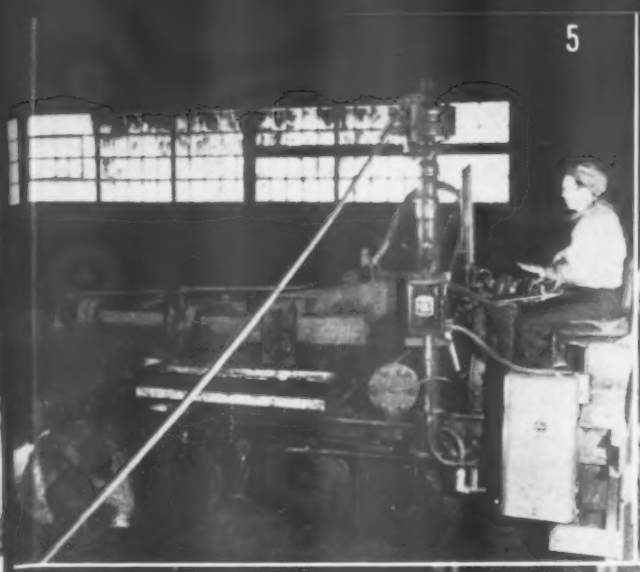


Fig. 4 — Cleaning the surface of a roll casting on the chipping floor

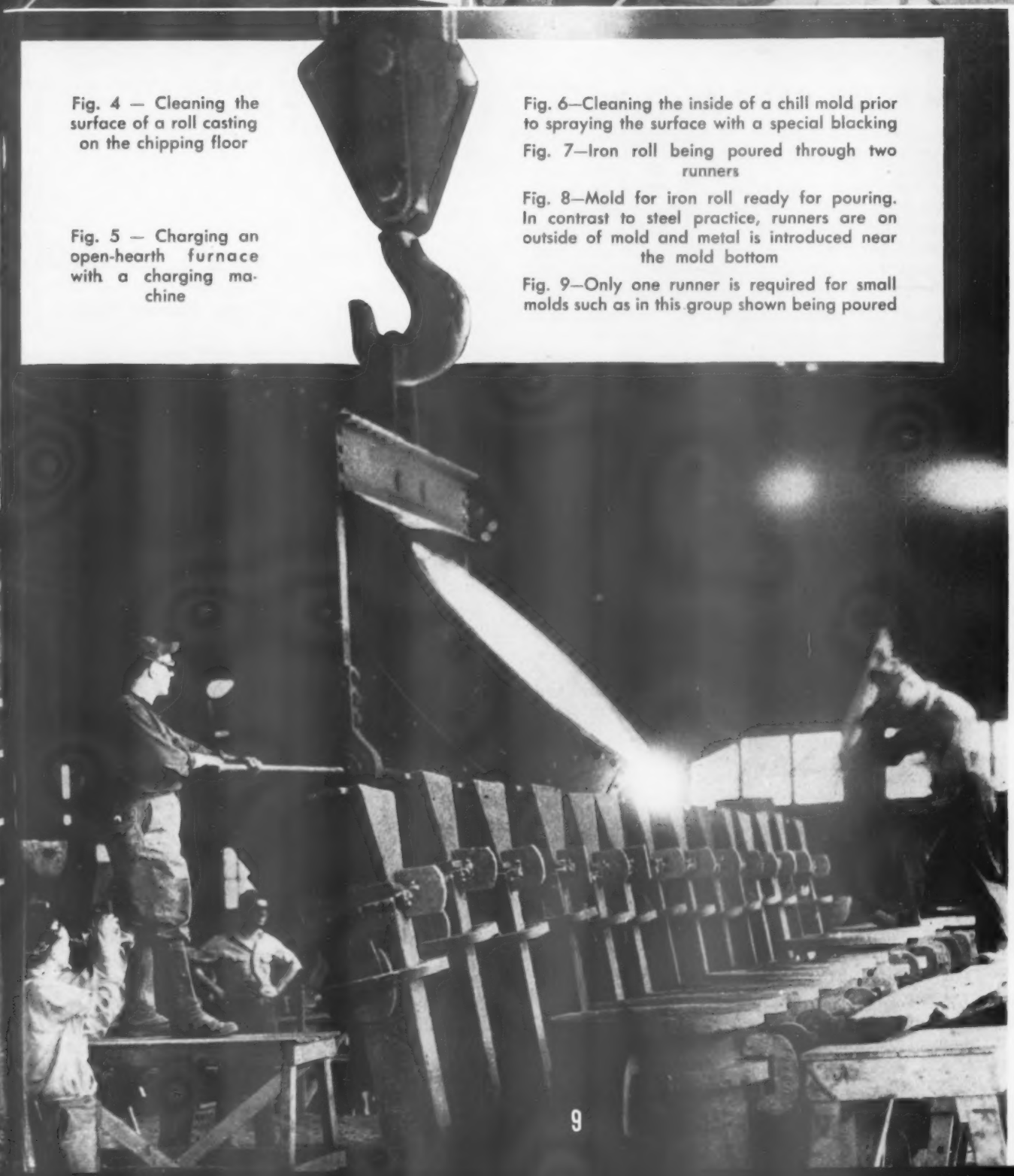
Fig. 5 — Charging an open-hearth furnace with a charging machine

Fig. 6—Cleaning the inside of a chill mold prior to spraying the surface with a special blacking

Fig. 7—Iron roll being poured through two runners

Fig. 8—Mold for iron roll ready for pouring. In contrast to steel practice, runners are on outside of mold and metal is introduced near the mold bottom

Fig. 9—Only one runner is required for small molds such as in this group shown being poured



Questions AND Answers

How to Use Nickel Anode Butts

Q.—We would like to know if we could use nickel anode butts from electroplating operations as an addition to gray iron to reduce chill. We understand that the material is quite pure. How can it be used?

A.—Addition of the nickel anode butts to gray iron will reduce the tendency toward chilled edges, and the amount may range from 0.10 to 1.0 per cent which probably will have to be determined by experiment. While for your purpose it would be preferable to add the nickel in the spout or ladle, you undoubtedly will not be able to do that since the butts are in relatively large pieces as compared to nickel shot usually employed for such additions. Hence, you will have to add the nickel to the iron charge in the cupola. Since there practically is no loss of nickel in the melting operation, just add the desired quantity in the center on top of the iron charge. For example, if you decide to add 0.15 per cent Ni, use 2½ oz of nickel butts per 100 lb iron; for 0.25 per cent addition use 4 oz, etc.

Producing Soil Pipe Fittings

Q.—We operate a small foundry and are making soil pipe and fittings to meet local needs. Cores for the fittings are made in halves with a proprietary rosin and sulphur liquor as the binder. After baking we paste them together with a syrup of sulphite and rosin binder and rebake, but the paste does not have much cold strength, the cores often coming apart in handling. Can you suggest something which will work better? Also could we increase our soil pipe fitting production by getting shell patterns and using green sand cores instead of dry sand cores. Is it possible to use some type of molding machine for fitting production?

A.—In answer to your question on a suitable core paste, we believe that you will find a number of proprietary materials on the market which will function satisfactorily. Probably your difficulty with the rosin and glutrin is that there is not enough of the binder present to do the job, or possibly it does not get hot enough to develop the adhesive property of the rosin. You also might try the following: Bentonite 3 per cent, dextrin 6 per cent, and silica flour 91 per cent. These are mixed thoroughly in the dry state, and then with water to make the consistency about that of soft putty.

The answer to your question on whether soil pipe fittings can be made by machine is yes. Most of them are made on squeezer molding machines, and also the cores are green sand rather than dry sand. One method of making the cores is as you indicate, by using a shell pattern and producing both mold and core at the same time, and the other is to make the cores separately on machines with solid patterns in halves, and booking them.

Two procedures may be used with the shell pattern which forms the core at the same time the mold is being made. In the first the drag mold is made, turned over and some sand placed in the shell pattern. Then the cast iron core arbor is pressed down into place. Second half of the pattern is adjusted, and sand packed into place through the end openings. Cope is rammed, and lifted off. Top half of the pattern is removed, the core lifted out and placed on a convenient stand, bottom half of the pattern removed, and then the whole is reassembled. In the second method the procedure is the same except that after the cope is removed, the whole mold is rolled over so that the cope rests on the bench. The drag then is taken off and the drag half of the pattern removed. Drag is replaced, the mold rolled over, and the cope removed. Cope half of the pattern is removed, and then the cope is placed in position again.

Gray Iron Castings Have Holes

Q.—We are having trouble with small holes in our gray iron castings; most of them are right in from the gate. Could this be gas, and if so, how can we prevent it? The iron contains 2.40 per cent Si, 0.70 per cent Mn, 0.143 per cent S, 0.50 per cent P, and 3.00 per cent TC. Can you suggest any way to bring down the sulphur? We also are having rat tails with covers. Can this be prevented in any way?

A.—We are not quite sure whether the holes you refer to are interior and found after the gate is broken off, or are on the surface just in front of the gate. In the first type, the trouble undoubtedly is one of shrinkage due to lack of feed, and the gates should be opened up to some extent to prevent freezing off before the casting solidifies. If the holes show up on the surface, they probably are due to a sand condition or hard ramming at that point. The fact that you have rat tails on other castings points to the need for looking over your sand.

Rat tails are caused by a break in the mold face due to compressive forces set up by high volume growth of a hot-strength sand. Various means may be employed to correct the trouble such as softer ramming; addition of seacoal, cereal, wood flour; use of coarser sand, and of course, the changing of sand to another one which possesses the proper expansion and hot strength characteristics. However, we believe that the occurrence of rat tailing in one type of casting and blow holes in another may be due to ramming a little too hard.

As far as reduction of sulphur is concerned, the only procedure to obtain a marked decrease is by treatment of clean molten iron with soda ash. However, you may be able to obtain some reduction by using fluorspar or soda ash in the cupola in connec-

tion with the limestone fluxing. Procedure with soda ash is to use double the amount of limestone on the bed with 1 lb soda ash for each 10 lb of stone. Also on the following two or three regular charges add 1 lb soda ash for each 10 lb stone. Soda ash then is reduced to 1 lb for each 20 to 40 lb stone.

Sand Causes Holes in Casting

Q.—We are sending to you a food grinder body casting which contains a number of small holes on the surface, and would like to know if there is any material on the market which could be used to fill them so that the casting could be salvaged. Casting is tinned inside and out, and the usual iron dust filler cannot be used as the tin will not adhere. Also can you tell us why the holes appear, and suggest a remedy?

A.—The small holes shown on the casting surface are termed sand holes, and result from displaced sand grains being washed along with the metal stream; finding lodgement at the interface as the metal congeals. We do not know of any material which can be used to plug such small holes economically. They could be welded, or after tinning could be filled with tin by using a soldering iron, but the cost would be out of proportion in our estimation. Possibly some of the holes or pits could be ground out with abrasive-faced polishing wheels, but there again, the operational costs would have to be considered.

The displaced sand grains which cause the holes or pits may come from a number of places. In examining the casting we observed that some sand has washed away from or broken off along the gate, and also along the mold joint where the core joins the mold. Perhaps it might be that those particles of sand are the cause of the pits, or they might be washed from the sprue, or from around the top edge of the sprue. Hence, with this particular type of casting constant vigilance is required to see that the mold is perfectly clean, and the sand condition is properly maintained. Attention also should be given to the fit of the core in the mold prints so that there is no pinching or crushing.

Moisture Deposits on Steel Band

Q.—We are making brake drums for the automotive trade which employ a steel stamping as the backing or web with the rim or braking surface of cast iron. Our trouble is to prevent deposition or accumulation of moisture on the web insert between the time it is placed in the mold, and the time the mold is poured —which may be as much as five hours. We know this could be prevented if the molds were poured a few minutes after closing, but since under our present operation this cannot be done, we are trying to find some method whereby the inserts can be fused into the cast iron in a satisfactory manner.

A.—The only positive method we know of to prevent precipitation of moisture on the steel backing plate of the brake drums is to maintain the temperature of the plates the same as or slightly higher than that of the molding sand. While numerous references have been made to application of various coatings such as chalk, whiting, talc, etc. to metal inserts to prevent blowing, those in our opinion are used to protect the cleaned surface from oxidation or other contamination prior to setting in the mold.

Previous reference to cleaned surface brings up another point, and that is what method you employ to insure a perfectly clean surface at the section to be covered or fused with iron. Abrasive blasting would be a logical approach, and you probably could design a fixture to hold the parts if you only want to clean a band around the outside rather than the whole piece. If the cleaned pieces are stored before use, a coating of some kind should be applied to protect the surface. Equipment also is available for chemical degreasing and cleaning the steel webs, which emerge from the machine dry and hot, ready for placing in the molds.

Shrinks Occur in Sheave Wheels

Q.—From time to time we have been having trouble on some of our sheave wheels. Principal difficulty lies in the shrinkage at junction of spoke and rim, as indicated on the accompanying blueprint of a 34⅞-in. diam, 9-in. face sheave. We have been able to hold this to a minimum by using an iron containing 3.0 to 3.10 per cent TC, 0.10 per cent P, 1.5 to 1.75 per cent Si, and 0.90 per cent Mn. We pour with the hottest iron available—usually 2720°F or better. We have been gating these sheaves through the hub and using two risers on the rim, churning these risers after pouring. We have been wondering whether or not some of our troubles might lie in the design of the sheaves. Do you know of any standards that might exist covering the relationship between sizes of rim and spoke?

A.—So far as we know there are no standards covering relationship between sizes of rim and spoke. Certain formulas are available to designers for determining rim thickness, etc., but they usually indicate that they are approximations to be used with caution. You may be interested to know that Northcutt

GANGWAY! By J. A. PATTERSON

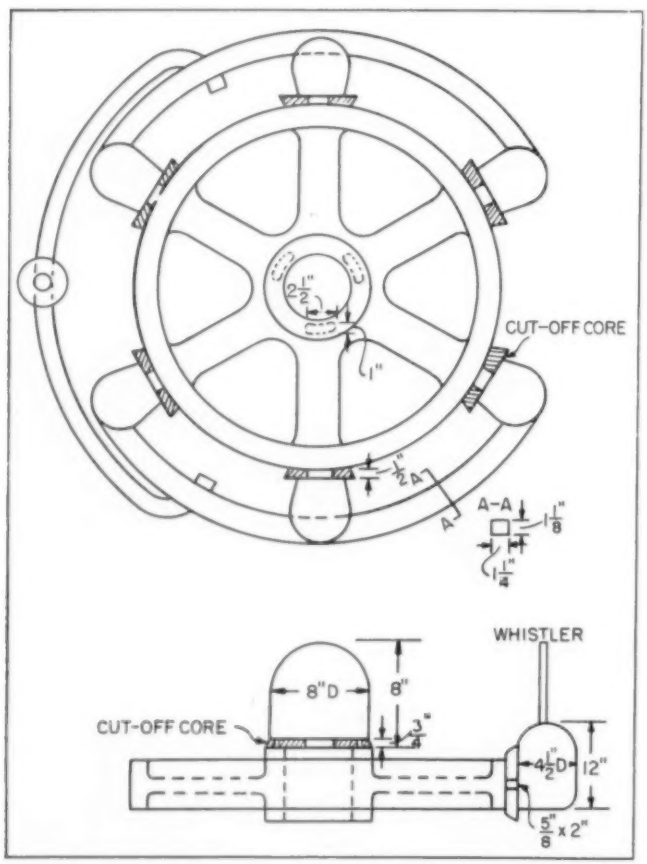
"See here, Razzputtin, about this little side business of yours—."

Questions AND Answers

and Lee in some work on centrifugal casting of small nonferrous wheels found that elimination of cracks and porosity at juncture of spoke and rim required that the total cross-sectional area of the spokes should be one-tenth the total volume of the rim. However, it hardly is likely that you can persuade a designer to apply that arrangement to a large wheel.

Your problem in this sheave wheel is one of maintaining sufficient supply of molten metal to take care of the change in volume due to solidification. From the volume/surface area relationships of the spokes and rim, it appears that the spokes freeze first, and hence do not feed the rim during its period of solidification. You mention that you are using two risers on the rim which are not sufficient as indicated by the shrinkage areas found. We believe that you can eliminate that trouble by increasing the number of risers to six—one for each spoke—and locating them on the outside of the rim, employing a neckdown core for the connection.

If placing the risers as suggested does not remedy the trouble, you may have to apply the procedure indicated in the accompanying illustration which was advocated by some foundrymen to overcome a similar trouble in producing a cast steel gear blank. You will note that the blank is gated into the rim through neckdown or cut-off cores which, in addition to providing easier removal, create hot spots at the junctions to insure longer feeding.



Gating system for sheave includes blind risers attached to the rim opposite each spoke. Risers are divided into two groups of three each, and fed from a single sprue

Must Withstand Acetic Acid

Q.—We have an inquiry from one of our customers concerning aluminum standing up under steam from 4 per cent acetic acid. Can you suggest an alloy which will work best under those conditions?

A.—Since a number of factors enter into the exact determination of resistance to corrosion attack of a metal or alloy, the usual practice is to conduct an investigation under actual operating conditions or as near to them as possible so that a definite answer can be supplied. Possibly an aluminum alloy containing 2 per cent Mn would serve, but it is not used to any great extent since it is rather hard to handle in the foundry. Perhaps the 5 per cent Si alloy could be used. However, we suggest that you get in touch with the large producers of aluminum since they undoubtedly have conducted investigations on the suitability of aluminum and its alloys for various applications, and can advise you.

Wants Suitable Iron Analysis

Q.—We are pleased to advise you that your suggestions relative to producing a hydraulic press head solved our problem, and we have made at least twenty-five of these castings since with only one having defects. Elimination of extra risers, churning, etc., materially reduced the labor involved with considerable savings. Other castings of similar design are being poured in the same manner and results have been highly satisfactory. Now we would like to ask you for further assistance. Some of our customers have complained about our castings being hard to machine. Can you recommend analysis of a gray iron suited for light and medium weight machinery castings?

A.—We appreciate your remarks relative to our suggestions helping you out of your difficulty, but we do not know whether we can be as successful in answering your present inquiry since there are so many possibilities, and differences in melting and molding practices. You mention that your customers are having difficulty in machining castings, but do not state exactly what the difficulty is. One factor in machining complaints is that too many machine shops expect high strength irons to machine like a piece of cheese—which is contrary to the fact. With proper machine feeds and tools such irons can be machined without difficulty. Possibly the complaint is about hard edges. That trouble can be overcome by the addition of graphite or graphitizing inoculants in the ladle.

If the overall structure of the iron is hard, you might be able to eliminate that by increasing the silicon content. One method is to add it in the charge by use of higher silicon pig iron or ferrosilicon briquets. The other is to add the additional silicon (not over 0.75 per cent) in the ladle. One hitch in making suggestions as to suitable compositions is

(*Concluded on page* 104)

NISILOY*

...A POWERFUL, POSITIVE INOCULANT

CUTS FINAL COST OF GRAY IRON CASTINGS

BENEFITS TO CASTING USERS

EXCELLENT MACHINING QUALITIES — The dense, gray, machinable structure secured with Nisiloy reduces machining time, tool wear, rejects and costs.

INCREASED WEAR-RESISTANCE — The formation and distribution of finely divided random flake graphite accomplished with Nisiloy assures highly improved resistance to wear.

IMPROVED TOUGHNESS—Nisiloy acts to eliminate hard, chilled areas in thin and thick sections alike . . . thus, the casting is thoroughly machinable yet less sensitive to breakage in machining operations and general service.

DEPENDABLE PRESSURE-TIGHTNESS — The sound, homogeneous structure attained by inoculating with Nisiloy results in dense cast iron that provides substantially improved pressure-tightness.

BENEFITS TO FOUNDRYMEN

REDUCES REJECTS—Used for structure control of cast iron, Nisiloy helps your foundry meet daily schedules for uniform lots of machinable gray iron castings.

PROMOTES SOUND CASTINGS — Diffusing rapidly throughout the melt, Nisiloy promotes a dense, close-grained product.

CURBS BREAKAGE — Even where section thickness varies sharply, Nisiloy serves to eliminate chilled edges and surfaces, thus affording a tougher cast iron that resists breakage in shop handling.

NO SCRAP PROBLEM—Containing only elements that dissolve freely in iron, Nisiloy permits remelting sprues and gates in any successive melt without risk of adding chill-forming elements.

FEWER BASE MIXTURES—Often a single base mixture may be used in the cupola to which Nisiloy is added in the ladle, with the consequent flexibility of pouring off thin or thick sectioned castings as desired.

Use the coupon below for full information about one of the most useful products ever offered for improving machinability and structure of gray iron castings. Nisiloy contains 60 per cent nickel, 30 per cent silicon, balance essentially iron. Fill in and mail the coupon now.

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TRADE MARK

THE INTERNATIONAL NICKEL COMPANY, INC.
Dept. **TF,** 67 Wall Street, New York 5, N. Y.

Please send me your booklet entitled,
"NISILOY" for GRAY IRON CASTINGS

Name.....*Title*.....

Company.....

Address.....

City.....*State*.....

*Trade Mark of The International Nickel Company, Inc.

THE INTERNATIONAL NICKEL COMPANY, INC. 67 WALL STREET NEW YORK 5, N. Y.

Questions AND Answers

(*Concluded from page* 102)

that you did not mention the section thicknesses involved or whether the irons need high strength, resistance to wear, etc. For example, if a tensile strength of 35,000 to 40,000 psi with good wear resistance is satisfactory, and the sections run ¼ to ½-in., an iron containing 2.00 to 2.30 per cent Si, 0.55 to 0.75 per cent Mn, 0.30 per cent P max., 3.10 to 3.40 per cent TC, 1.50 per cent Ni and 0.45 to 0.55 per cent Cr will serve. Brinell hardness is around 200 and the iron can be machined at speeds up to 75 sfm. If a higher strength iron of 40,000 to 50,000 psi is required, Si should be reduced to 1.40 to 1.60 per cent.

With sections from ½ to 1 in. and a tensile strength of 35,000 to 40,000 psi, the silicon can be 1.40 to 1.60 per cent, with other elements the same as previously indicated. Dropping the silicon content about 0.30 per cent will increase the tensile strength.

Manganese Bronze in the Cupola

Q.—Do you have any information on making manganese bronze in the cupola? We would like to point out that we by no means consider the cupola a satisfactory melting device for this purpose, but on occasion we have reluctantly resorted to it. The urgent need of more melting capacity than our nonferrous activity could supply being the reason. To the uninitiated who care to try this job we can promise a fearsome experience and only a long odds chance of satisfactory end results. Any information that you can supply on this subject will be appreciated.

A.—While there are some indications in the literature that manganese bronze has been produced in the cupola, there is no actual description of the process except a brief mention of melting the copper and hardener in the cupola, adding the zinc in the ladle, and pouring the resulting alloy back and forth a couple of times in two ladles to obtain better mixing with the remark that the metal was not so good. Possibly that practice with the departure of adding the cupola melted copper and hardener to molten zinc in the ladle would give better results since the temperature loss would be low as compared to use of cold zinc.

However, that would not permit the use of scrap manganese bronze in the cupola as part of the charge. Zinc loss in cupola melting as indicated by Mauland and Long is extremely high. The latter indicates that with alloys containing only 3 to 6 per cent Zn the loss is about 60 per cent, and presumably with a high Zn-bearing alloy like manganese bronze (38-42 Zn) might be even greater. Alvin mentions that in melting a zinc-containing alloy in the cupola that zinc oxide in considerable quantities was distributed over the neighborhood as far as a ¼-mile away requiring the installation of a fume eliminating system at the cupola. In some references mention is made to use of limestone and a little iron oxide to provide a free-running slag in reclamation of concentrates, drosses, copper wire, etc. All in all the general tenor of the references to the cupola melting of high zinc alloys is that it is not satisfactory—paralleling your experience.

Core Oven Should Be Purchased

Q.—We are starting a small foundry on very limited capital, and have decided to construct our own core oven to be oil-fired, and 6 x 8 x 6½ ft high. Can it be built of common red brick faced on the inside with firebrick? What is the proper wall thickness? Should the chimney be erected at the end opposite to the firing chamber, or can it be in the center of the roof? Other features about the chimney include height, inside size, size and position of flue connection, number and position of draft openings.

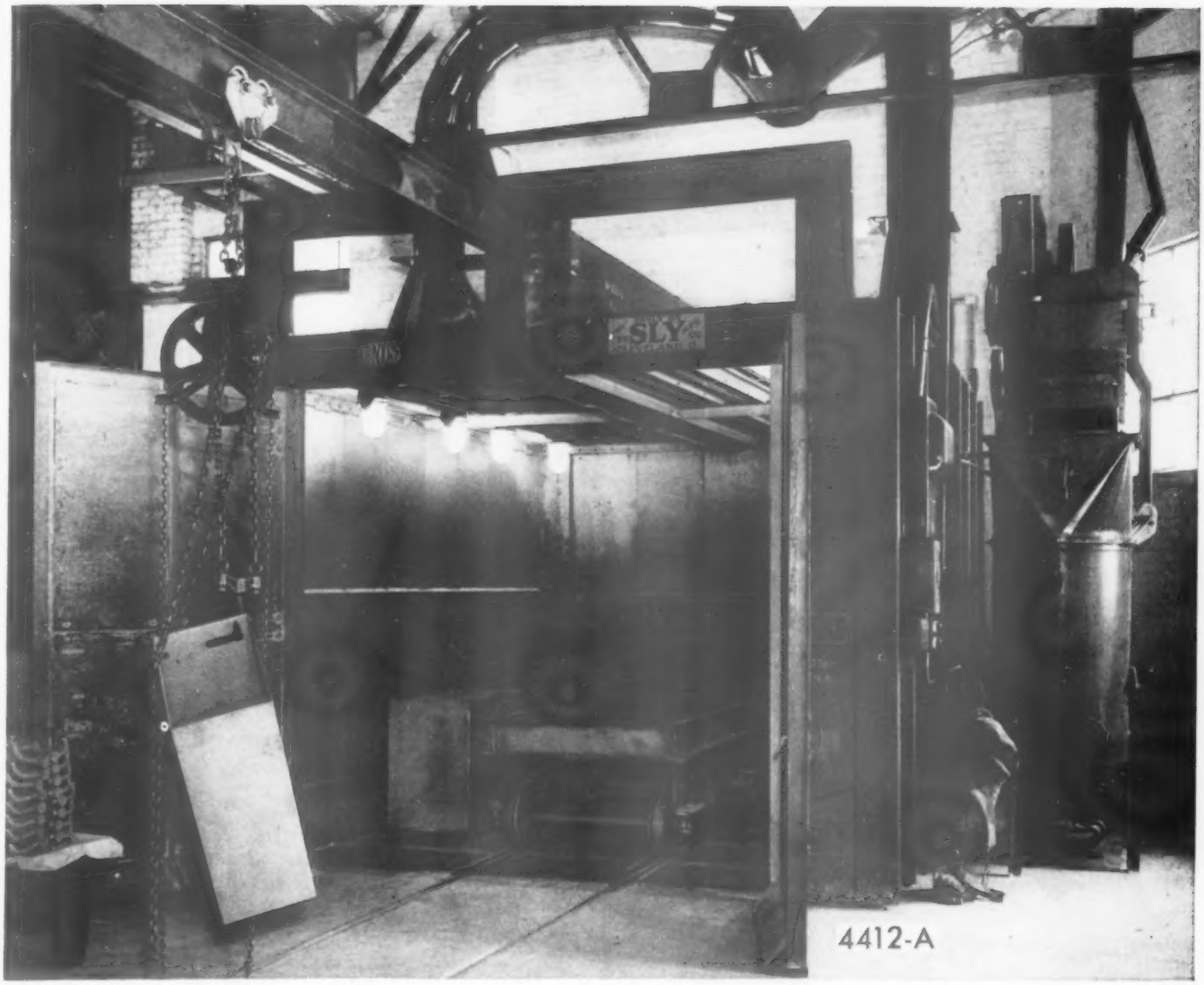
A.—To bake cores properly and economically, it is essential that the ovens be constructed so that a uniform temperature prevails in all sections, and we believe that you will be much farther ahead to purchase a unit from a reputable manufacturer who has the engineering experience to produce an efficient oven. However, since you definitely feel that you must build your own oven the following remarks apply to your questions in order of presentation:

A red brick wall 9 in. thick will serve except in the vicinity of the firing chamber if the burner is placed in a firing chamber at or near the floor level and in the end wall opposite the oven door entrance. Best place for a brick or steel stack is at or near the same end as the firing chamber. This might be outside the foundry wall. A v-shaped flue in the floor with openings near the door extends to the base of the stack. Flue openings may be closed with loose plates. Each branch of the underground flue is 12 x 12 in. A brick or steel stack 20 ft high and 12 x 12 in. or 14 in. in diam will serve. The six foot wide roof is formed in two parallel arches 3 ft wide resting on a steel or cast iron beam in the center. Spring of the arch need not be over 3 in. If gas is available in your locality you might lay a 3-in. gas pipe on the floor at the base of each side wall. Pipes are perforated with ¼-in. holes on the top side about 6 in. apart. This would do away with the firebox

Wants To Use Carbon Molds

Q.—Is it practical to make gray iron castings in carbon molds? Castings will need no machining, and are wheels and sprockets for agricultural machines. These are 18 to 20 in. in diam weighing 28 to 41 lb each. Will the castings pick up carbon?

A.—While carbon and graphite molds are being used to some extent in the production of nonferrous castings, we do not recall any application to gray iron. As far as the molten iron picking up carbon from such a mold, we doubt that you need worry much as considerable time and high temperature will be required for that reaction. We are somewhat doubtful on whether the wheels and sprockets you mention can be made successfully in a non-yielding material since enough trouble usually is encountered when sand molds are used which does permit the castings to contract to some extent. However, the only way to determine that point is to make an experimental mold and try it out.



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A Triple Slotted Ceiling distributes the ventilating air all over the room, at the same time preventing the escape of rebounding abrasive.

Vent Ducts in two-room walls have inlet openings at bottom to draw the ventilating air and dust down.

Clear Vision is obtained by constant and effective exhaust of the dust.

Excellent Illumination is provided by special blast room lighting fixtures with glass globes ½" thick.

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Men OF INDUSTRY

GEORGE W. ANSELMAN, recently service engineer, Goebig Mineral Supply Co., Chicago, has become foundry superintendent, Woodruff & Edwards Inc., Elgin, Ill. Prior to 1943, Mr. Anselman was with Ayers Mineral Co., Zanesville, O., as service engineer and superintendent of the company's Tennessee mill. He received his training at Lewis Institute, Chicago, and served his apprenticeship at Western Electric Co. Inc., Chicago.

♦ ♦ ♦

R. E. Wilke has been appointed general metallurgist, American Radiator & Standard Sanitary Corp., with present headquarters at the main office in Pittsburgh. Mr. Wilke has been associated with the foundry industry since 1928 when he joined Chicago Malleable Castings Co., Chicago, as chemist. In 1935 he became foundry metallurgist for John Deere Tractor Co., Waterloo, Iowa, remaining there until 1941, when he was appointed foundry metallurgist in the testing and research laboratories of Deere & Co., Moline, Ill. Mr. Wilke has been an active member of the Quad City Chapter of the AFS and was chairman in 1944-45.

♦ ♦ ♦

C. W. Gullickson has been appointed district manager of the St. Louis office of Sterling Wheelbarrow Co., Milwaukee, succeeding the late Otto E. Steep. Mr. Gullickson joined the company in 1936 and became a member of the Milwaukee office sales staff. Following three years of Army service he returned to the company and for the last three years has been a salesman in the Cincinnati district.

♦ ♦ ♦

J. Ernest Higson, since 1907 associated with Western Foundry, and president of U. S. Foundries Inc., both of Denver, has completed 60 years of active association with the foundry industry, during which time he has been influential in the development of the industry in the Denver area. A native of Milwaukee, where he was born in 1871, he went to Gunnison, Colo., at an early age, where his father became foundry superintendent of Gunnison Iron Works. Mr. Higson became a partner in Western Foundry in 1907 and now operates it on a partnership basis with his son, J. L. Higson. He was elected president of U. S. Foundries Inc. last May following several years' service as vice president.

♦ ♦ ♦

Kenneth M. Smith, until recently president, Lancaster Malleable & Steel Corp., Lancaster, N. Y., has joined National Malleable & Steel Castings Co., Cleveland, as assistant to the vice president in charge of sales. Mr. Smith attended Princeton University and has headed the Lancaster company since 1938. Prior to that he was associated with Horace E. Dodge Boat & Plane Corp., Detroit, where he was managing director for seven years. Before then he was president and a director of Gould Storage Battery Co., Depew, N. Y. Mr. Smith represented the malleable iron industry on the War Production Board advisory committee during the war. He has been a director of Malleable Founders' Society for the last six years and served as its president in 1946.

♦ ♦ ♦

Raymond L. Collier, executive vice president, Gray Iron Founders' Society, has been elected a director of American Trade Association Executives, national professional organization of trade association managers. Mr. Collier, a graduate of Ohio State University, has spent 22 years in trade association work, including national associations of lighting fixture manufacturers, steel foundries and, for the past year and a half, with gray iron foundries.

♦ ♦ ♦

Samuel M. Gahagen has been appointed chief metallurgist, Jessop Steel Co., Washington, Pa. Mr. Gahagen was educated at Pennsylvania State College, Carnegie Institute of Technology, and University of Buffalo. He previously served in metallurgical and other technical capacities with American Steel & Wire Co., Crucible Steel Co., Vanadium Corp., and until recently with Rustless Iron & Steel Corp., Baltimore.

♦ ♦ ♦

C. W. Staacke, for 22 years a member of B. F. Goodrich Co.'s engineering staff, Akron, O., has joined Hewitt-Robins Inc., New York, as technical consultant and special assistant to the president, Thomas Robins Jr. Mr. Staacke, who was graduated from Ohio State University, served as a special consultant to the Army and Navy Air Forces on fuel cell development during the war.

(*Continued on page* 108)

GEORGE W. ANSELMAN

R. E. WILKE

C. W. GULLICKSON

J. ERNEST HIGSON

Our Own Source of Coal

Our Own Source of Ore

Our Own Coking Plant

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WOODWARD IRON COMPANY

(*Continued from page* 106)

He will serve as technical co-ordinator of the research and development activities of Hewitt-Rubber Division, Buffalo, N. Y., Robins Conveyors Division, Passaic, N. J., and Robins Engineers Division, New York, maintaining headquarters in the company offices in the latter city.

♦ ♦ ♦

Aubrey M. Callis, formerly sales manager of the Chicago territory, Federated Metals Division, American Smelting & Refining Co., has been appointed to the newly created position of general sales manager. Mr. Callis has been associated with Federated since 1920 in clerical, sales and plant executive capacities, serving in Portland, Oreg., Pittsburgh and Los Angeles. In 1945 he was appointed sales manager of the Chicago territory, at Whiting, Ind., which office he leaves to assume his new appointment. **J. W. Kelin,** formerly sales manager of the St. Louis territory, succeeds Mr. Callis as sales manager at Chicago. Mr. Kelin joined Federated in 1924, serving chiefly in the St. Louis territory where he became sales manager in 1944. He has been active in the St. Louis District Chapter of the AFS, which he has served as secretary-treasurer the last 7 years. **Paul H. Jackson** has been appointed to succeed Mr. Kelin in St. Louis. Mr. Jackson joined the company's sales force in 1939 and has been district sales manager in Seattle since 1943.

♦ ♦ ♦

Gordon C. Creusere, for the last 10 years consulting metallurgist at Detroit for the Semet-Solvay Division, Allied Chemical & Dye Corp., has retired and will make his home at 427 South M St., Lake Worth, Fla. Mr. Creusere's early metallurgical experience began in the steel industry on castings and ingot work, as melter, steelmaker and melting superintendent. He spent two years as consulting metallurgist on sponge iron development for the Syndicato National de Industria E Commercio, Rio de Janeiro, and upon his return to the United States entered the gray iron field, serving in metallurgical positions in the automotive industry until 1938.

♦ ♦ ♦

Stoddard J. Small has been elected vice president and a director, Moline Iron Works, Moline, Ill., succeeding the late L. E. Nutt. Mr. Small will handle product development and sales promotion of the company's manufactured products, including molding machines. Previously associated with Harris-Upham & Co., Chicago, he served in the Navy for 5 years and was commissioned a lieutenant commander. **B. V. Nutt** has been elected chairman of the company's board of directors, **M. C. Nutt** president, **William J. Dowsett** treasurer, and **Wallace A. Hall** secretary. Officers named were also elected directors of the company. **A. M. Vehmeier** has been made assistant secretary.

♦ ♦ ♦

Robert S. Bowie has been named head of a branch sales office recently opened at 122 South Michigan Ave., Chicago, by Cooper-Bessemer Corp., Mount Vernon, O. Mr. Bowie was graduated from Cornell University in 1935 with a degree in mechanical engineering and joined Cooper-Bessemer the following year as a member of its headquarters sales staff in Mount Vernon and subsequently has been associated with the Dallas sales office. He has been active in the Chicago area since 1946.

♦ ♦ ♦

Morrison H. Watkins has been appointed controller, Oklahoma Steel Castings Co., Tulsa, Okla., and its affiliated companies. A graduate of Pennsylvania State College, Mr. Watkins has had 20 years of experience as an accounting executive and in management engineering. He was formerly executive assistant to the vice president, Unexcelled Chemical Corp., New York; manager of systems and methods, Bendix Helicopter Inc., and director of procedures, Sperry Gyroscope Co. Inc., Great Neck, N. Y.

♦ ♦ ♦

H. M. Cowart, formerly vice president and assistant secretary-treasurer, Alabama By-Products Corp., Birmingham, has been elected executive vice president, treasurer and a director, succeeding the late H. L. Morrow. **Frederick G. Koenig Jr.** has been named assistant secretary and retains his former position as company attorney. **J. Elbert Johnson,** formerly a sales representative of the company, has been elected assistant treasurer.

♦ ♦ ♦

Parker F. Wilson has been elected president and a director, Kerotest Mfg. Co., Pittsburgh, succeeding **Walter G. Swaney** who has been made vice chairman of the board of directors. Mr. Wilson, well known in the steel industry for more than 20 years, has served in various executive capacities with Otis Steel Co., Wheeling Steel Corp., and as president, Pittsburgh Steel Foundry Corp.

♦ ♦ ♦

George Innes has been appointed works manager, Barnett Foundry & Machine Co., Irvington, N. J. Mr. Innes joined the company in 1945 and was previously associated with Worthington Pump & Machinery Corp., Harrison, N. J.

♦ ♦ ♦

Joseph Prendergast, until recently foundry production manager, Sullivan Machinery Co., Claremont, N. H.,

(*Continued on page* 112)

J. W. KELIN

PAUL H. JACKSON

AUBREY M. CALLIS

GORDON C. CREUSERE

How to put new life into old sand

Here's an amazingly effective way to reclaim sand in your foundry.

Use a Robins Gyrex Screen for your sand recovery operation. It puts new life into old sand . . . *fast!*

This high-speed, large-capacity vibrator screens out lumps, reinforcements, chips, and other unwanted substances. The sand is revived, emerges clean, drops into storage bins, and is again ready for use.

What's more, you get sand that is *always uniformly graded to your exact specifications.* That means you save time. It means you save money, too!

The Robins Gyrex Screen is ideal for your job for three big reasons:

It's flexible. Its slope is adjustable from horizontal to 28° to suit changing load requirements.

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It's durable. Its screening surface is rubber-mounted and held drum-tight under spring tension to prevent the constant flexing that leads to crystallization.

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PRODUCT	EQUIPMENT FORMERLY USED	EXPERIENCE WITH FORMER EQUIPMENT	SAVINGS EFFECTED WITH WHEELABRATOR CABINET
AUTOMOTIVE CYLINDER BLOCKS	Tumbling Mills and Airblast Room	45 Laborers needed . . . Excessive costs.	Elimination of 14 laborers . . . costs slashed . . . 180 blocks cleaned hourly.
RAILROAD AIR BRAKE CASTINGS	Airblast Barrels	Cleaning costs 42.6c per casting.	Wheelabrator cost 26.5c per casting. $5,853.96 saving in five-month period.
BATH TUBS AND SANITARY WARE	Airblast Rooms	Excessive cleaning costs, labor and time requirements.	60 bathtubs or up to 540 pieces of small ware Wheelabrated hourly.
RADIATOR AND BOILER SECTIONS	Wire Brushing	Gang of laborers . . . unsatisfactory cleaning quality.	Cleaning time cut 50%. Continuous cleaning with two operators.
ELECTRIC MOTOR CASTINGS	Three Large Tumbling Mills	Unable to keep up with production. Labor cost excessive.	Decrease of 7 laborers. Six hours work now Wheelabrated in only 9 minutes.
GRAY IRON JOBBING CASTINGS	Airblast Room	Poor working conditions. Cleaning room a bottle neck.	Cleaning costs reduced 30%. 500% faster cleaning.

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This Special Cabinet Wheelabrates 1000 dozen shovels in eight hours.

Wheelabrator Cabinet used for reconditioning corroded oil pipe line.

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Removing welding spatter from fabricated steel assemblies.
Graining lithograph printing plates.
Renovating used steel drums and barrels.
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Removing scale from pipe skelp prior to welding.
Eliminating glare from aluminum license plates and road signs.
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Cleaning culvert stock prior to galvanizing.
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Roughening textile loom pins to provide a non-slip contact with leather drive belts.
Removing gloss from asphalt tile blocks.
Preparing surfaces of printing press roller cores prior to rubberizing.
Removing scale from locomotive boiler flues.

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WORLD'S LARGEST BUILDERS OF AIRLESS BLAST EQUIPMENT

(*Continued from page* 108)

has been appointed vice president in charge of operations at the foundry of Amoskeag Steel Corp., Manchester, N. H., which was recently opened for the production of carbon and alloy electric steel castings. Mr. Prendergast has had 35 years of foundry experience and has spent 26 years in the production of steel castings.

♦ ♦ ♦

Edmund B. Kinne has been appointed product engineer, McConway & Torley Corp., Pittsburgh. Mr. Kinne, a graduate of Mt. Union College and University of Michigan, has been associated with McConway & Torley since 1943, where he has served as production engineer and assistant to the general superintendent. Prior to that he was assistant chief inspector, American Steel Foundries, East Chicago, Ind., and assistant manager in charge of production at that company's Pittsburgh and Verona, Pa., plants.

♦ ♦ ♦

S. De Vries has been appointed sales representative in Connecticut for the material handling equipment of George Haiss Mfg. Co. Inc., New York, division of Pettibone Mulliken Corp., Chicago. Mr. DeVries, who has had more than 20 years of experience in sales, application and servicing of conveyors, will handle the company's newly redesigned equipment which includes belt and drag type conveyors, package handling and sectional conveyors, bucket loaders and clamshell buckets.

♦ ♦ ♦

George M. Ullom has been appointed district sales manager at Portsmouth, O., for Harbison-Walker Refractories Co., Pittsburgh. Mr. Ullom, who attended Carnegie Institute of Technology, joined Harbison-Walker in 1929 as assistant sales correspondent. He served in various other sales capacities until 1940, when he was transferred to the Portsmouth sales office. Last year he was made a member of the St. Louis sales office with headquarters in Kansas City, Mo.

JOHN T. LLEWELLYN II

Named president, Chicago Malleable Castings Co., Chicago. Reported in *The Foundry*, August, p. 108.

Dr. A. B. Parsons has resigned as secretary, American Institute of Mining and Metallurgical Engineers, effective in February, 1949. In the meantime he will be on leave of absence, with residence at 6091 Castle Drive, Oakland, Calif. **E. H. Robie**, who has been principal assistant to Dr. Parsons during nearly all of his tenure of office in AIME, will be acting secretary during the remainder of the year.

♦ ♦ ♦

E. B. Forse, formerly manager of the Refractories Division of the Carborundum Co., Perth Amboy, N. J., has been appointed assistant vice president. Mr. Forse will undertake special assignments relative to problems arising from expanding markets for refractories and crude silicon carbide. For the present his headquarters will remain at Perth Amboy. **C. E. Hawke** succeeds Mr. Forse as manager of the Refractories Division, in charge of sales and manufacturing. Mr. Hawke was formerly director of company sales. **E. R. Baxter** has been appointed director of sales and sales administration and will assume full responsibility for direction of the field sales force and co-ordination of field sales activities with those of the various divisions of the company. **G. R. Rayner Jr.** has been named assistant director of sales administration in charge of various phases of sales administration at Niagara Falls and in the district offices.

♦ ♦ ♦

G. A. Watson has been appointed manager of sales for the Chicago division of Electro Metallurgical Sales Corp., unit of Union Carbide & Carbon Corp., succeeding **J. H. Spillane**, who has been transferred to the general sales office in New York. Mr. Watson has served in various sales and service capacities in both the Chicago and Detroit offices of the company.

♦ ♦ ♦

Fred B. Riggan, formerly chief metallurgist, Key Co., East St. Louis, Ill., has been made foundry manager and general superintendent. **Arnold Czechowicz** has been appointed assistant foundry superintendent, and **Robert Jacoby** chief metallurgist.

♦ ♦ ♦

B. F. Bilsland, for the last 15 years manager of the Chicago district, Allis-Chalmers Mfg. Co., Milwaukee, has been named manager of the newly formed Midwest territory, embracing six district and six branch offices in Illinois, Iowa, Indiana, Kentucky, Missouri, Nebraska, Wisconsin and Minnesota. Mr. Bilsland was graduated from Purdue University and has been

(*Concluded on page* 114)

EDMUND B. KINNE

S. DE VRIES

GEORGE M. ULLOM

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HIGH OR LOW SPEED SNAGGING WHEELS for floor stand, swing frame and portable machines . . . DISC WHEELS . . . CONES . . . MOUNTED POINTS . . . CUT-OFF WHEELS . . . BAYFLEX RAISED HUB DISCS . . . CORE FILES . . . on all of these products Bay State is anxious to serve you. Send us your problems.

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BAY STATE ABRASIVE PRODUCTS CO., WESTBORO, MASSACHUSETTS, U. S. A.

(*Concluded from page* 112)

associated with Allis-Chalmers since 1919. He will continue to make his headquarters in Chicago. **J. C. Collier** succeeds Mr. Bilsland as Chicago district manager. A graduate of North Carolina State College of Engineering, Mr. Collier has been associated with the company since 1916. He has been in the Chicago office for 19 years.

♦ ♦ ♦

Forrest E. Allen, formerly a member of the faculty of Iowa State College, in the department of mechanical engineering, and associate professor in charge of instruction on metallurgy, has joined the Development and Research Division, International Nickel Co. Inc., New York. Mr. Allen will make his headquarters in New York and will develop the company's educational program with universities and colleges in the United States. He received bachelor's and master's degrees in mechanical engineering from Michigan State College and University of Michigan, respectively, and has a background of practical and consulting experience.

♦ ♦ ♦

R. B. Jenner, until recently in the Boston sales office of Harbison-Walker Refractories Co., Pittsburgh, has been named head of its refractory plastics and castables division. Prior to joining Harbison-Walker in 1944, Mr. Jenner was associated with Briggs Mfg. Co., Detroit, United Engineers & Constructors Inc., and more recently with Cities Service Oil Co.

♦ ♦ ♦

Dr. Carl F. Prutton, formerly head of the department of chemistry and chemical engineering, Case Institute of Technology, Cleveland, has been appointed director of research, Mathieson Chemical Corp., New York, with headquarters in the New York executive offices and at the research laboratories, Niagara Falls, N. Y. Dr. Prutton was a faculty member at Case from the time of his graduation at that school in 1920, until 1948. He was consultant to the Lubri-Zol Corp., Wickliffe, O., from 1928 until he joined Mathieson, and consultant to Dow Chemical Co., Midland, Mich., from 1928 until 1941. From 1942 to 1944 he served as chief of the process development branch of the Office of Rubber Director and was also consultant to the War Production Board.

♦ ♦ ♦

Lewis E. Rosser has been named manager of the Wenatchee, Wash., plant, recently acquired by Keokuk Electro-Metal Co., Keokuk, Iowa. Mr. Rosser, who was graduated from Rolla School of Mines Division, University of Missouri, with a degree in metallurgy, has been metallurgist for Keokuk Electro-Metal Co. for the past year and a half.

♦ ♦ ♦

Paul E. Miller and **Jack R. Koske** have been appointed regional sales supervisors in the Mid East and East Central sections of the country respectively for Eutectic Welding Alloys Corp., New York. They were formerly field engineers for the company.

♦ ♦ ♦

Harry Rogers has been appointed superintendent, Production Foundries Inc., Ft. Wayne, Ind., succeeding **Harry Howell,** who has been made superintendent of the new magnesium casting division, Kendallville Foundry Inc., Kendallville, Ind.

♦ ♦ ♦

In addition to his duties as plant metallurgist, Malleable Foundry Division, American Chain & Cable Co., York, Pa., **David Tamor** has been appointed chief metallurgist of the Reading, Pa., plant.

♦ ♦ ♦

G. O. Romig has been appointed sales manager of the Cleveland plant of the Claud S. Gordon Co., Chicago. Mr. Romig joined the company as sales engineer in 1945 following three years of Army service.

British Institute of Metals Holds Meeting

CAMBRIDGE was the site of the recent 40th annual autumn meeting of the (British) Institute of Metals.

The meeting was opened Sept. 15 by the president of the institute, Sir Arthur Smout. Members and guests were officially welcomed by the mayor of Cambridge, and the president extended the greetings of the institute to members and delegates from overseas, Australia, Belgium, Canada, France, India, Switzerland and the United States. American visitors were: Dr. F. C. Frary, director of research, Aluminum Co. of America, New Kensington, Pa.; Irving Rossi, Rossi Continuous Casting Co., New York; Dr. George Sachs, lately director, research laboratory for mechanical metallurgy and professor of physical metallurgy, Case Institute of Technology, Cleveland, now en route to take up an appointment as director of the National Metallurgical Laboratory, Jamshedpur, India; Dr. C. S. Smith, director, Institute for the Study of Metals, University of Chicago, and honorary corresponding member of the council of the I. of M. for the United States.

A number of papers were presented and discussed during the mornings of Sept. 15 and 16, the afternoons and the whole day on the 17th being devoted to visits.

E. Wilfred Taylor, joint managing director, Troughton & Simms Ltd., York, contributed a paper on "Micro-Hardness Testing of Metals," in which reference is made to the methods employed for testing the hardness of metals and alloys, and attention is directed to the fact that when an indenter is used the impressions made are large in relation to the microstructure of the specimen. The desirability is stressed of a form of hardness test which can be applied to a particular crystal or to a small selected area, and the factors controlling the application of very light loads to a diamond indenter are examined.

Damping Capacity Discussed

A paper by G. A. Cottell, research engineer, British Engine, Boiler & Electrical Insurance Co. Ltd., Manchester, K. M. Entwistle, department of metallurgy, University of Manchester and F. C. Thompson, professor of metallurgy, University of Manchester, was entitled "The Estimation of Specific Damping Capacity from Measurements of Experimental Decay Curves." The authors' investigation confirms that the physical and mechanical methods are in fact measuring the same property, and shows that—at least aluminum alloys—results of the same order can be obtained by the two methods, provided that the apparatus is designed correctly.

"The Effect of Vibration on a Precipitation-Hardening Aluminum Alloy" was the title of a paper presented by Dr. R. F. Hanstock, research laboratories, High Duty Alloys Ltd., Slough. J. S. Bowles, school of metallurgy, University of Melbourne, Australia, and Dr. Ing. W. Boas, of the Council of Scientific and Industrial Research, Melbourne, presented a paper on "The Effect of Crystal Arrangement on 'Secondary Recrystallization' in Metals." Dr. Maurice Cook, director, Imperial Chemical Industries Ltd., Witton, near Birmingham and Dr. T. Richards, research physicist of the same firm, contributed a paper entitled "Observations on the Annealing Characteristics of an Aluminum-Copper-Magnesium Alloy."

The last paper to be presented was by Dr. E. Voce, metallurgist, Copper Development Association, Radlett, Herts., on "The Relationship between Stress and Strain for Homogeneous Deformation."

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MICHIGAN FOUNDRY CONFERENCE

Hears Discussion on Nodular Graphite Iron

By WILLIAM G. GUDE
Managing Editor
THE FOUNDRY

ANOTHER in the series of successful foundry conferences conducted at Michigan State College, East Lansing, Mich., was held there Oct. 1-2 under sponsorship of the school's Department of Mechanical Engineering in co-operation with the four Michigan chapters of the American Foundrymen's Society. Prof. C. C. Sigerfoos of Michigan State College and chairman of Central Michigan Chapter, AFS, headed the committee which arranged the instructive and entertaining conference program. Attendance exceeded 150.

Among the various interesting papers and discussions, probably the most attention was attracted by a talk on "Magnesium Treatment for Nodular Graphite Gray Iron," by Charles K. Donoho, chief metallurgist, American Cast Iron Pipe Co., Birmingham.

Increases Tensile Strength

Mr. Donoho first referred to work of the British Cast Iron Research Association in which irons of improved strength and toughness have been produced by small additions of cerium, which develops nodular graphite—instead of the usual flake graphite—in the iron structure. He added that experimental work in this country indicates magnesium has the same effect as cerium in the treatment of iron. For example, a 1.25 per cent addition of nickel-magnesium to a normally low-strength iron resulted in a nodular graphite iron having a tensile strength of 95,000 psi.

Experiments have been conducted with various types of magnesium alloys. Some of these—including titanium, zirconium, calcium and manganese—gave unsatisfactory results, and most of the additions used to date have been in the form of nickel-magnesium. Good results also were obtained with use of magnesium alloy aircraft scrap. The addition is made to the ladle, and this presents a problem because only about 10 per cent of the magnesium is dissolved in the metal, the remainder burning. Attempts are being made to find a more efficient method of getting the magnesium into solution.

A necessary part of the treatment is a silicon inoculation after the magnesium addition. Prompt pouring of the molten iron also is a requisite, the nodular graphite structure gradually being lost as the metal is held.

Unusual toughness in these irons, accompanied by high tensile strength, is obtained with a one-hour anneal. As an indication of the former, Mr. Donoho mentioned that valve bodies which were to be broken up after being tested to destruction had to be machine cut because they resisted sledge blows.

Comparing the cerium and magnesium treatments, the latter has the advantage of satisfactory results with low-carbon iron, whereas cerium requires a hypereutectic material. Magnesium is somewhat hazardous to handle, but apparently should offer economies over cerium, particularly once a more efficient addition method is developed.

The opening technical session, with Stanley Davis, Campbell, Wyant & Cannon Foundry Co., Muskegon, as chairman, included the first public showing of a new motion picture describing the production of cylinder block castings at the Rouge production foundry of Ford Motor Co. Frank C. Riecks, AFS national director, and manager of Ford foundries, discussed the various operations depicted.

A comprehensive review of various types of mold and core wash materials and their functions was given by Dr. J. A. Ridderhof, manager, foundry facings department, Frederic B. Stevens Inc., Detroit. Dr. Ridderhof emphasized that care must be exercised in selecting the proper wash, since the type will vary with kind of metal poured. He also recommended use of mechanical equipment in mixing a dry wash and the standardization of the mixing operation. Equipment should be kept clean, and if a round tank is employed, baffles should be installed for thorough mixing. The proper Baume of the wash mixture can be ascertained for each job through testing sample cores, and once established should be adhered to in mixing.

Continuing on the subject of washes, Robert B. Melmoth, metallurgical engineer, Ford Motor Co., Dearborn, pointed out that the efficiency of the material can be affected by its improper use. He recommended regular check of the mixture's Baume and use of a dry material in preference to a paste. Slides were shown of wash applications at Ford foundries, these including both spraying and dip, and removal of excess wash by air blowing or spinning of the cores.

Preceding the second technical session, at which O. E. Sunstedt, general manager, General Foundry & Mfg. Co., and chairman of the Saginaw Valley Chapter, was chairman, a short talk was given by E. W. Horlebein, president, Gibson & Kirk Co., Baltimore, and national vice president of the AFS. Mr. Horlebein commended the sponsors of foundry conferences and pointed to their value in the exchange of practical information.

Physical, mechanical and chemical properties of core binders were discussed by Joseph A. Gitzen, president, Delta Oil Products Co., Milwaukee. He reviewed in detail the various types of organic and inorganic binders and their proper applications. While oil binders give the greatest tensile strength per unit cost, many foundries use too much oil, he stated. Excessive oil can prevent the center of cores from hardening because insufficient oxygen is present to permit the necessary chemical change to take place.

Reviews Gray Iron Metallurgy

A concise but fairly complete review of gray iron metallurgy and its relation to foundry practice was presented by K. H. Priestly, president, Vassar Electroloy Products Inc., Vassar, Mich. He discussed the effect of various elements in iron and the influence of different alloys on physical properties. In the latter connection he pointed out that most alloys provide better properties when employed in combination with others than when used singly. Mr. Priestly also described the types and application of inoculants, and showed slides depicting the structures of various composition irons.

An illustrated talk on "Foundry Layouts," by R. L. McIlvaine, vice president and sales manager, National Engineering Co., Chicago, offered helpful suggestions on procedure when expansion or new construction is planned for the molding department. Factors to be considered include the range of castings to be made, type of sand to be used, type of iron to be poured, character of demand, period required for amortization of investment, provisions for future expansion, local working regu-

(*Concluded on page* 118)

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(*Concluded from page* 116)

lations, etc. He recommended the providing of production banks behind each foundry operation so that emergency shutdown of one department or operation does not interfere with other activities.

Other suggestions by the speaker were to regulate the size of storage facilities according to material supply, to provide sufficient head and pit room for equipment in order to simplify maintenance, and to eliminate excessive maintenance to equipment by supplying ample capacity. Mr. McIlvaine illustrated his points by numerous slides of foundry layouts.

At the concluding session, presided over by A. W. Stolzenburg, process and products engineer, Aluminum Co. of America, Detroit, and chairman of the Detroit Chapter, George Tubich, Michigan Department of Health, Grand Rapids, spoke on "Attracting and Keeping Good Men in Your Foundry." His discussion outlined various health hazards prevailing in ferrous and nonferrous foundries and methods of providing better working conditions which will make the industry more attractive to employees.

A lively discussion on causes of defects in various castings assembled in a display at the meeting concluded the conference. The subject was unusually well handled by Harry E. Gravlin, Ford Motor Co., Dearborn. Members of the audience were given an opportunity to examine the castings and were provided sheets containing pertinent data concerning metal and sand composition, pouring temperature, etc. Suggestions were offered by the audience as to factors possibly responsible for the defects, and these were tabulated and discussed.

A dinner meeting Friday evening completed the conference program. This was presided over by L. G. Miller, formerly head of the Department of Mechanical Engineering and recently appointed dean of the School of Engineering. Principal speaker was Prof. Russell E. Horwood, who presented an interesting talk, illustrated by slides, on his recent year's experience in Japan while in government service.

INDUSTRIAL RELATIONS CONFERENCE

Held by Steel Founders' Society of America

By WILLIAM G. GUDE
Managing Editor
THE FOUNDRY

RECOGNITION by the steel foundry industry of the importance of industrial relations, because of their influence on plant operations and product quality, was demonstrated by success of the recent first annual Industrial Relations Conference of the Steel Founders' Society of America. Held at Hotel Sheraton, St. Louis, Sept. 23-24, with an attendance of about 135, the conference was arranged as part of the program of the society's National Personnel Committee under the chairmanship of Harry L. Simmons, personnel director, Scullin Steel Co., St. Louis.

Numerous subjects were discussed at the various sessions, including such topics as incentive plans, pension programs, employee benefits, community relations and employee publications.

Mr. Simmons presided at the first session, which was opened by a welcoming address by F. Kermit Donaldson, SFSA president and vice president and general manager, the Machined Steel Casting Co., Alliance, O. Mr. Donaldson stressed the need for greater attention to industrial relations problems and expressed the hope that success of the conference would result in its becoming a regular part of the society's program.

The role of incentive plans in reducing costs was discussed by W. G. Woodhams, manager of industrial relations, Symington-Gould Corp., Depew, N. Y. Possible savings, he indicated, lie in improved quality and yield, more effective supervision, and reduced labor turnover with consequent reduction in training costs and in work spoiled by new employees. All incentive plans require definite standards which are understood by the employees, regardless of the basis on which the plan is established, he stated. A plan based on individual effort usually is preferable, but in some cases a group basis is more effective.

"Incentives for Indirect Workers," a paper presented by C. E. Westover, Westover Engineers, Milwaukee, pointed out that the control of labor hours required for indirect work can be assisted materially by the same principle of reward for effort developed for the production worker; further, that an incentive plan applied to direct workers should, in the interest of good labor relations, be extended to indirect workers as well. Mr. Westover discussed three methods commonly used in setting up incentives for indirect work. These include: 1—Direct time standards applied to the work produced and established in the same manner as standards for direct workers. 2—Ratio of indirect to direct work. 3—Budget or bonus plans designed for workers whose duties involve a variety of tasks, such as the general plant maintenance crew.

Technological progress in this country has not been matched by the attention to and improvement in the various factors which make for good industrial relations, it was pointed out in a discussion of "Profit Sharing for Better Production" by Dr. Robert S. Hartman, executive secretary, Council of Profit Sharing Industries, Columbus, O. Describing profit sharing as any procedure under which all employees receive, in addition to good regular pay, special current or deferred sums, Dr. Hartman explained various types of plans. These include direct payments which are calculated as a certain percentage of the company's profits; wage dividends based on the amount of dividends paid stockholders; the stock ownership plan under which the company bears all or part of the cost; and trust plans which accumulate sums for retirement payments. Other plans, of a more indirect nature, are the annual wage; payments based on a percentage of sales; a sharing in cost savings; and the co-operative sharing plan in which employees are both co-owners and co-managers.

The second session, presided over by J. C. Breithaupt, personnel director, Dodge Steel Co., Philadelphia, was opened by a talk by the society's general counsel, Chauncey Belknap, Patterson Belknap & Webb, New York. Mr. Belknap urged industry to treat industrial relations as a major factor which contributes to the success or failure of a company, and strongly recommended that responsibility for carrying out company programs associated with industrial relations be placed in the hands of a capable individual interested in the successful progress of the program.

Dangers inherent in nationwide

(*Continued on page* 120)

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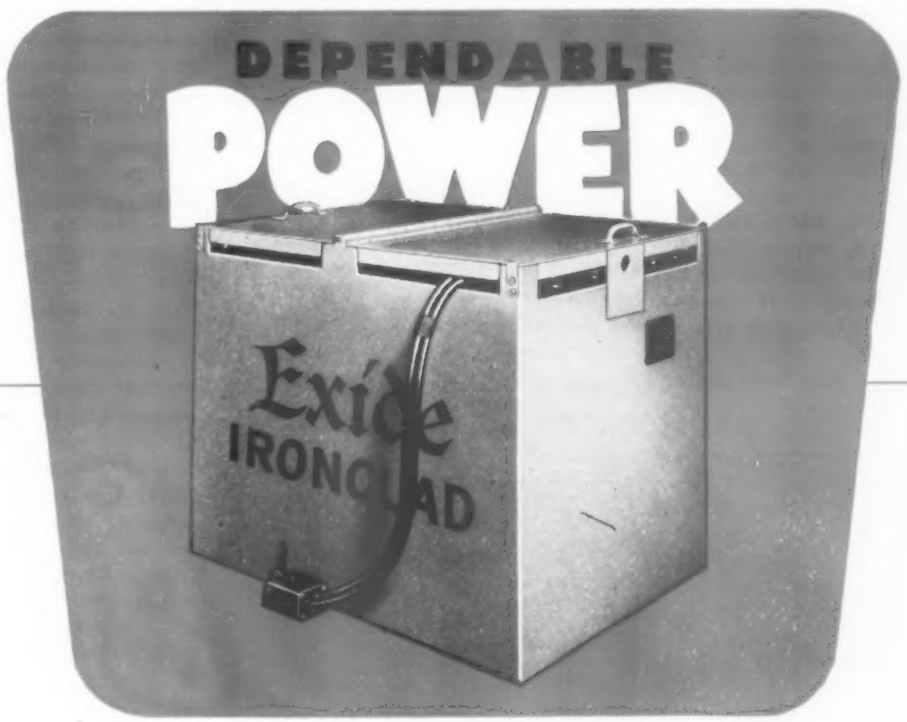

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(*Continued from page* 118)

wage patterns were discussed by Ray Booth, secretary-manager, Tri-State Industrial Association Inc., Pittsburgh. He described the effects of wage settlements established on such a basis in which a nation-wide pattern was followed.

"Handling Fringe Problems" was the title of a paper by E. J. Walsh, manager of industrial relations, American Steel Foundries, Chicago, in which he listed various factors outside straight wage payments which go to make up total labor costs. These include vacations, holidays, shift premiums, severance pay, pensions, insurance, etc. He recommended close study of the effect of all such items on all departments of the company before making them part of labor contracts.

Gray Iron Founders Award First Gold Metal

FIRST award by the Gray Iron Founders' Society of its newly created gold medal, which is offered as the highest award to individuals rendering outstanding, unselfish service in behalf of the industry, was

ARTHUR E. HAGEBOECK

presented recently to Arthur E. Hageboeck, executive vice president, Frank Foundries Corp., Moline, Ill.

The award was made at the society's 20th annual meeting in Atlantic City, Oct. 14-15. The solid gold medal, measuring 2½ inches in diameter and ¼-inch thick, weighs nearly 4 ounces. A bronze replica of the medal and an illuminated scroll commemorating the award also were presented Mr. Hageboeck.

Mr. Hageboeck has long been active in the Gray Iron Founders' Society and was instrumental in organization of its predecessor, the Gray Iron Institute, which he served as president. He has been particularly prominent in cost committee work and currently is chairman of that group in the society. He has served in similar capacity on the foundry cost committee of the American Foundrymen's Society, of which he is a past national director. Mr. Hageboeck attended the University of Chicago and was graduated from the University of Iowa in 1907. In 1915 he became associated with the Frank Foundries Corp., then located at Davenport, Iowa, and since the building of the Moline, Ill., plant he has served there in executive capacities.

In addition to the award to Mr. Hageboeck, illuminated scrolls were presented to four others in recognition of meritorious service to the foundry industry and the society. Recipients were: John M. Price, president, Ferro Machine & Foundry Co., Cleveland; Philip Frankel, secretary-treasurer, Superior Foundry Inc., Cleveland; Arthur J. Tuscany, executive secretary, Foundry Equipment Manufacturers Association, Cleveland, and Howard A. Stockwell, treasurer, Barbour Stockwell Co., Cambridge, Mass., and president of the society the last two years.

A complete report on the society's annual meeting will be presented in the December issue.

An interesting analysis of pension and other employee benefit plans in effect at plants of members of the Steel Founders' Society was presented at the Friday morning session by Leslie C. Thellemann, executive vice president of the society. Session chairman was William P. McGervey Jr., Hanford Foundry Co., San Bernardino, Calif. A survey showed that 31 per cent of the companies have pension plans, of which two-thirds cover both salaried and hourly employees, and the remainder only salaried individuals. In two-thirds of the plans the cost is borne by both the company and the beneficiaries, in other cases by the company alone. In the former instances most companies bear two-thirds of the cost.

One-half of all companies have accident, health and life insurance programs for their employees. A few have hospitalization insurance alone, while others have various combinations of the different types of protection. The majority of these programs require cost sharing by both the company and employees.

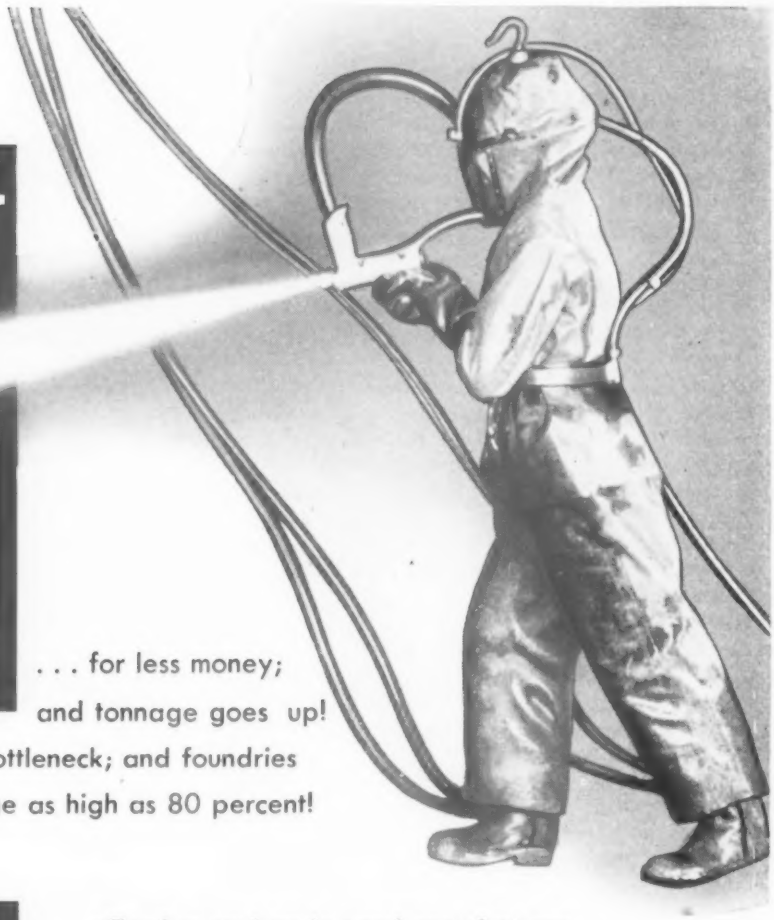
Outlines Sound Pension Plan

Requirements of a sound pension plan, according to J. H. Shreiner, vice president, Towers, Perrin, Forster & Crosby Inc., Philadelphia, are: 1—A valid reason for the plan. 2—Attractiveness to the workers. 3—Ability of the company to absorb its cost in bad times. Actually the cost of a retirement income program can be cheaper than that of transferring old employees to easier jobs or of keeping them in present jobs to which they no longer are adapted, the speaker stated. Pensions also make for more satisfied employees and less labor turnover. The plan should provide benefits to all employees and it should incorporate a definite period after which these benefits accrue.

W. P. Dudley, secretary and treasurer, Ohio Steel Foundry Co., Lima, O., described the procedure followed by that company in establishing its pension plan in 1941. Now applied to all employees, about 50 to 55 per cent of the cost is borne by the company; this represents a cost to the company of about 2 cents per hour for all employees. Employees contribute 3 per cent of their monthly income and at retirement age of 65 receive a monthly life income of 1 per cent of that income for each full year of membership. Employees become eligible to participate in the plan after five years of service. The eligible group currently represents about one-half of all employees, and two-thirds of those eligible now are

(*Concluded on page* 122)

HYDRO-BLAST



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(*Concluded from page* 120)
participants.

Speaking on "Insurance, Hospitalization and Sick Benefits," Elmer S. Ward, assistant treasurer, United Engineering & Foundry Co., Pittsburgh, indicated that comprehensive protection should include life insurance, medical and surgical benefit plans for both employees and dependents. Group life insurance is relatively cheap, he stated, and has the advantage of covering individuals not otherwise eligible. He recommended pre-employment physical examinations as a means of keeping the cost of benefit plans under control. A sound benefit plan, he added, plays an important part in good industrial relations.

Community relations activities of the Belle City Malleable Iron Co. and Racine Steel Castings Co., Racine, Wis., were described at the concluding session by E. O. Jones, personnel director of those companies. Chairman of the session was C. P. Caldwell, president, Caldwell Foundry & Machine Co., Birmingham. Mr. Jones discussed various methods of interesting people in the foundry, including advertising, the open-house, plant visitations by students, professional and other local groups, and participation in civic affairs.

A discussion on "Telling Management's Story to the Employee," by R. S. Falk, assistant to the president, the Falk Corp., Milwaukee, was supplemented by an extensive exhibit of publications of various companies. This exhibit, arranged by Robert H. Weaver, the Falk Corp., included booklets issued to new workers and publications intended for distribution both to employees and outside the company. Mr. Falk indicated that direct communication with the employee in explaining the position and problems of management is the preferred approach. In the use of printed material he recommended that the message be timely, be understandable, varied and tied in with the interests of the individuals to whom it is directed.

The need for foundry training was stressed in a talk by Clement J. Freund, dean of the college of engineering, University of Detroit. He pointed out that the need is intensified by the fact no large group of young men is coming up through the industry's ranks. Steel founding is an art based on intricate sciences, and the more complex the skill required the more comprehensive the training must be, he stated, adding that the more highly mechanized a shop is, the more competent foundry mechanics are needed. The fruits of expanding research activities also will need additional numbers of trained men for their application.

The concluding paper, presented by Walter Moore, superintendent, Burnside Steel Casting Co., Chicago, on "Top Management's Responsibility to the Line Supervisor" was made up largely of actual opinions expressed by supervisors of what they expect from top management. While there was some variation in these expressions, it appears that supervisors are particularly interested in the following: To be kept informed—and at first hand—on company policies and proposed changes in them; to be provided with the proper tools, authority and safe working conditions to carry out the job; to be free to "go to bat" for their men without being considered anti-management; to receive wages commensurate with their responsibilities, the opportunity for advancement, and promotions based on demonstrated ability.

Congressman Hartley Speaks

Two luncheon sessions and a dinner also were included in the conference program. One luncheon, was presided over by H. A. Forsberg, vice president, Continental Foundry & Machine Co., East Chicago, Ind. The second, at which G. Rhoads Casey, president and general manager, Treadwell Engineering Co., Easton, Pa., was chairman, had as its speaker R. S. Munson, vice president and general manager, Atlantic Steel Casting Co., Chester, Pa., who gave a comprehensive review of the function of the steel foundry personnel department.

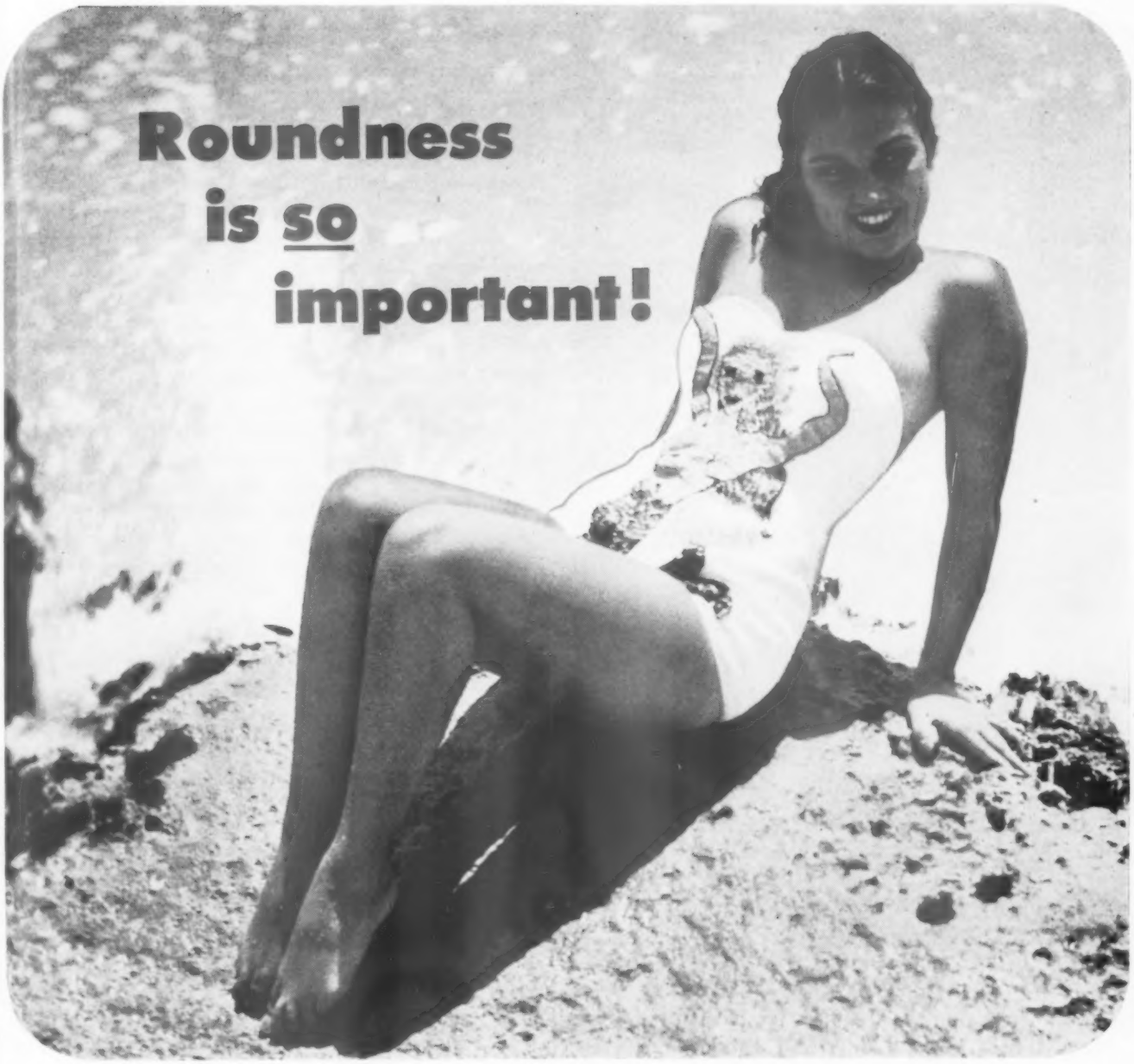
Principal speaker at the dinner, at which F. Kermit Donaldson presided, was Fred A. Hartley, member of Congress from New Jersey and co-author of the Taft-Hartley Act. Discussing the act, Mr. Hartley cited a number of abuses which the measure is intended to correct, and pointed out that 90 per cent of reported abuses referred to his Congressional committee for investigation came from labor. He indicated that while he saw no likelihood of repeal or drastic changes in the act—adding that the House vote to override the President's veto had the largest majority in history—nevertheless, any amendments which offer possibility of better realizing the law's intended purposes will be offered for consideration at Congress' next session.

A Little Pattern Shop Grows Up

DEUTSCH & Sons Pattern Works & Machine Co., 2172 South 43rd St., Milwaukee, manufacturer of patterns, checking fixtures, templates and models for industrial, automotive and aviation plants, recently held open house in its new plant. Organized as a small pattern shop on East Becher St., 26 years ago, the growing concern later transferred to larger quarters and about a year and a half ago moved to the present location.

Simon Deutsch is president of the firm and his son, Richard, is vice president. The company employs more than 50 skilled craftsmen many of whom have been with the firm for over 20 years, some having learned the trade there.

In the illustration above, Jesse Hading, one of the employees, is shown running some wood through a shaper. (*Milwaukee Journal* Photo).



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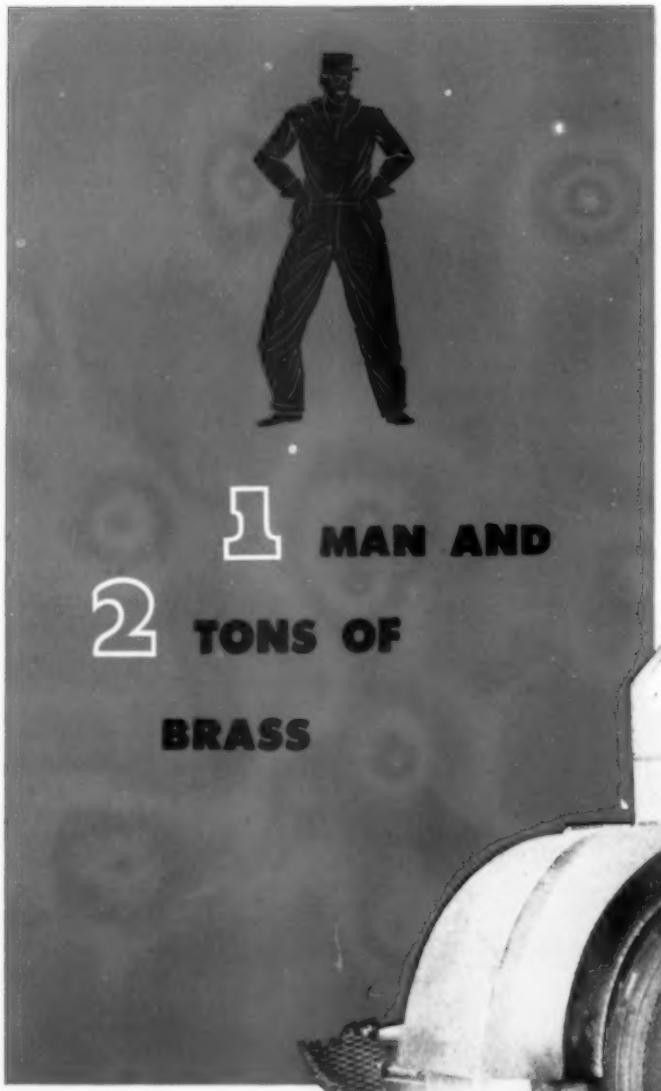

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STANDARD GRADES OF PIG IRON

American Iron and Steel Institute

(Continued from October)

Bes Phosphorus 0.076 to 0.100 Per Cent

This class of pig iron has as its distinguishing chemical characteristic a phosphorus content which is sufficiently low for the manufacture of steel by the acid bessemer process. The phosphorus content is higher, however, than that of the LP and LPi classes. As phosphorus is not eliminated by the smelting process of the blast furnace, ores low in that element must be selected for the manufacture of bessemer iron.

This class of iron is used by steel producers nearly always as hot metal in making acid bessemer steel. It is sometimes used in making acid open hearth steel when a phosphorus content in the steel somewhat higher than that obtained by the use of the LP class is permissible. It is now seldom furnished for the manufacture of bessemer steel and the principal merchant use of iron of the Bes class is in making iron ingot molds and rolls.

Table 3

Grade Designation	Composition, per cent Si	S Max.	P	Mn
Bes 113100m	1.00/1.25	0.05	0.076/0.100	1.00 max.
Bes 138100m	1.26/1.50	0.05	0.076/0.100	1.00 max.
Bes 163100m	1.51/1.75	0.05	0.076/0.100	1.00 max.
Bes 188100m	1.76/2.00	0.05	0.076/0.100	1.00 max.
Bes 213100m	2.01/2.25	0.05	0.076/0.100	1.00 max.
Bes 238100m	2.26/2.50	0.05	0.076/0.100	1.00 max.
Bes 263100m	2.51/2.75	0.05	0.076/0.100	1.00 max.
Bes 288100m	2.76/3.00	0.05	0.076/0.100	1.00 max.
Bes 113113	1.00/1.25	0.05	0.076/0.100	1.01/1.25
Bes 138113	1.26/1.50	0.05	0.076/0.100	1.01/1.25
Bes 163113	1.51/1.75	0.05	0.076/0.100	1.01/1.25
Bes 188113	1.76/2.00	0.05	0.076/0.100	1.01/1.25
Bes 213113	2.01/2.25	0.05	0.076/0.100	1.01/1.25
Bes 238113	2.26/2.50	0.05	0.076/0.100	1.01/1.25
Bes 263113	2.51/2.75	0.05	0.076/0.100	1.01/1.25
Bes 288113	2.76/3.00	0.05	0.076/0.100	1.01/1.25

M Phosphorus 0.101 to 0.300 Per Cent

This class of iron is used mainly for the production of malleable iron castings, but it is also used in the manufacture of gray iron castings when a lower phosphorus content is desired than is furnished in the Fl, Fh, or Fs classes. It is characterized by a phosphorus content intermediate between that of the Bes and Fl classes.

Table 4

Grade Designation	Composition, per cent Si	S max.	P	Mn
M 088063	0.75/1.00	0.05	0.101/0.300	0.50/0.75
M 113063	1.01/1.25	0.05	0.101/0.300	0.50/0.75
M 138063	1.26/1.50	0.05	0.101/0.300	0.50/0.75
M 188063	1.76/2.00	0.05	0.101/0.300	0.50/0.75
M 213063	2.01/2.25	0.05	0.101/0.300	0.50/0.75

Table 4 (Continued)

M 238063	2.26/2.50	0.05	0.101/0.300	0.50/0.75
M 263063	2.51/2.75	0.05	0.101/0.300	0.50/0.75
M 288063	2.76/3.00	0.05	0.101/0.300	0.50/0.75
M 313063	3.01/3.25	0.05	0.101/0.300	0.50/0.75
M 338063	3.26/3.50	0.05	0.101/0.300	0.50/0.75
M 088088	0.75/1.00	0.05	0.101/0.300	0.76/1.00
M 113088	1.01/1.25	0.05	0.101/0.300	0.76/1.00
M 138088	1.26/1.50	0.05	0.101/0.300	0.76/1.00
M 163088	1.51/1.75	0.05	0.101/0.300	0.76/1.00
M 188088	1.76/2.00	0.05	0.101/0.300	0.76/1.00
M 213088	2.01/2.25	0.05	0.101/0.300	0.76/1.00
M 238088	2.26/2.50	0.05	0.101/0.300	0.76/1.00
M 263088	2.51/2.75	0.05	0.101/0.300	0.76/1.00
M 288088	2.76/3.00	0.05	0.101/0.300	0.76/1.00
M 313088	3.01/3.25	0.05	0.101/0.300	0.76/1.00
M 338088	3.26/3.50	0.05	0.101/0.300	0.76/1.00
M 088113	0.75/1.00	0.05	0.101/0.300	1.01/1.25
M 113113	1.01/1.25	0.05	0.101/0.300	1.01/1.25
M 138113	1.26/1.50	0.05	0.101/0.300	1.01/1.25
M 163113	1.51/1.75	0.05	0.101/0.300	1.01/1.25
M 188113	1.76/2.00	0.05	0.101/0.300	1.01/1.25
M 213113	2.01/2.25	0.05	0.101/0.300	1.01/1.25
M 238113	2.26/2.50	0.05	0.101/0.300	1.01/1.25
M 263113	2.51/2.75	0.05	0.101/0.300	1.01/1.25
M 288113	2.76/3.00	0.05	0.101/0.300	1.01/1.25
M 313113	3.01/3.25	0.05	0.101/0.300	1.01/1.25
M 338113	3.26/3.50	0.05	0.101/0.300	1.01/1.25

B Phosphorus 0.400 Per Cent, Maximum

Bs Phosphorus 0.700 to 0.900 Per Cent

These classes of pig iron are used in making steel by the basic open hearth process. They are characterized by a low silicon limit and a considerably higher phosphorus content than is permissible in the Bes class. Iron made in the Southern districts differs in phosphorus and manganese content from that made in the Northern districts.

Table 5

Grade Designation	Si	S Max.	P Max.	Mn
B 100125sm	1.00 max.	0.05	0.400	1.01-1.50
B 113125m	1.01-1.25	0.05	0.400	1.01-1.50
B 138125m	1.26-1.50	0.05	0.400	1.01-1.50
B 100175sm	1.00 max.	0.05	0.400	1.51-2.00
B 113175m	1.01-1.25	0.05	0.400	1.51-2.00
B 138175m	1.26-1.50	0.05	0.400	1.51-2.00

Table 6

Grade Designation	Si	S Max.	P	Mn
Bs 100058sm	1.00 max.	0.05	0.700-0.900	0.40-0.75
Bs 113058m	1.01-1.25	0.05	0.700-0.900	0.40-0.75
Bs 138058m	1.26-1.50	0.05	0.700-0.900	0.40-0.75

STANDARD GRADES OF PIG IRON

American Iron and Steel Institute

Fl Phosphorus 0.300 to 0.500 Per Cent
Fh Phosphorus 0.501 to 0.700 Per Cent
Fs Phosphorus 0.700 to 0.900 Per Cent

These classes of pig iron in combination with iron and steel scrap and alloying elements are used for making iron castings by a remelting process in a very wide range of types and sizes. For example, castings requiring density of grain and good strength for steam and hydraulic cylinders, machine tools, dies, and similar uses; chilled castings such as rolls; heavy castings not to be machined; miscellaneous light and heavy castings which are to be machined, and light thin castings such as stove plate, radiator castings, plumbing supplies, and hardware specialties. The blending of several grades of iron to obtain desired composition in finished castings is common practice.

Table 7

Grade Designation	Si	S Max.	P	Mn
Fl 175063s	1.75 max.	0.05	0.300-0.500	0.50-0.75
Fl 188063	1.76-2.00	0.05	0.300-0.500	0.50-0.75
Fl 213063	2.01-2.25	0.05	0.300-0.500	0.50-0.75
Fl 238063	2.26-2.50	0.05	0.300-0.500	0.50-0.75
Fl 263063	2.51-2.75	0.05	0.300-0.500	0.50-0.75
Fl 288063	2.76-3.00	0.05	0.300-0.500	0.50-0.75
Fl 313063	3.01-3.25	0.05	0.300-0.500	0.50-0.75
Fl 338063	3.26-3.50	0.05	0.300-0.500	0.50-0.75
Fl 175088s	1.75 max.	0.05	0.300-0.500	0.76-1.00
Fl 188088	1.76-2.00	0.05	0.300-0.500	0.76-1.00
Fl 213088	2.01-2.25	0.05	0.300-0.500	0.76-1.00
Fl 238088	2.26-2.50	0.05	0.300-0.500	0.76-1.00
Fl 263088	2.51-2.75	0.05	0.300-0.500	0.76-1.00
Fl 313088	3.01-3.25	0.05	0.300-0.500	0.76-1.00
Fl 338088	3.26-3.50	0.05	0.300-0.500	0.76-1.00
Fl 175113s	1.75 max.	0.05	0.300-0.500	1.01-1.25
Fl 188113	1.76-2.00	0.05	0.300-0.500	1.01-1.25
Fl 213113	2.01-2.25	0.05	0.300-0.500	1.01-1.25
Fl 238113	2.26-2.50	0.05	0.300-0.500	1.01-1.25
Fl 263113	2.51-2.75	0.05	0.300-0.500	1.01-1.25
Fl 288113	2.76-3.00	0.05	0.300-0.500	1.01-1.25
Fl 313113	3.01-3.25	0.05	0.300-0.500	1.01-1.25
Fl 338113	3.26-3.50	0.05	0.300-0.500	1.01-1.25

Table 8

Grade Designation	Si	S Max.	P	Mn
Fh 175063s	1.75 max.	0.05	0.501-0.700	0.50-0.75
Fh 188063	1.76-2.00	0.05	0.501-0.700	0.50-0.75
Fh 213063	2.01-2.25	0.05	0.501-0.700	0.50-0.75
Fh 238063	2.26-2.50	0.05	0.501-0.700	0.50-0.75
Fh 263063	2.51-2.75	0.05	0.501-0.700	0.50-0.75
Fh 288063	2.76-3.00	0.05	0.501-0.700	0.50-0.75
Fh 313063	3.01-3.25	0.05	0.501-0.700	0.50-0.75
Fh 338063	3.26-3.50	0.05	0.501-0.700	0.50-0.75
Fh 175088s	1.75 max.	0.05	0.501-0.700	0.76-1.00
Fh 188088	1.76-2.00	0.05	0.501-0.700	0.76-1.00
Fh 213088	2.01-2.25	0.05	0.501-0.700	0.76-1.00
Fh 238088	2.26-2.50	0.05	0.501-0.700	0.76-1.00
Fh 263088	2.51-2.75	0.05	0.501-0.700	0.76-1.00
Fh 288088	2.76-3.00	0.05	0.501-0.700	0.76-1.00
Fh 313088	3.01-3.25	0.05	0.501-0.700	0.76-1.00
Fh 338088	3.26-3.50	0.05	0.501-0.700	0.76-1.00

Table 8 (Continued)

Fh 175113s	1.75 max.	0.05	0.501-0.700	1.01-1.25
Fh 188113	1.76-2.00	0.05	0.501-0.700	1.01-1.25
Fh 213113	2.01-2.25	0.05	0.501-0.700	1.01-1.25
Fh 238113	2.26-2.50	0.05	0.501-0.700	1.01-1.25
Fh 263113	2.51-2.75	0.05	0.501-0.700	1.01-1.25
Fh 288113	2.76-3.00	0.05	0.501-0.700	1.01-1.25
Fh 313113	3.01-3.25	0.05	0.501-0.700	1.01-1.25
Fh 338113	3.26-3.50	0.05	0.501-0.700	1.01-1.25

Table 9

Grade Designation	Si	S Max.	P	Mn
Fs 175063s	1.75 max.	0.05	0.700-0.900	0.40-0.75
Fs 188063	1.76-2.00	0.05	0.700-0.900	0.40-0.75
Fs 213063	2.01-2.25	0.05	0.700-0.900	0.40-0.75
Fs 238063	2.26-2.50	0.05	0.700-0.900	0.40-0.75
Fs 263063	2.51-2.75	0.05	0.700-0.900	0.40-0.75
Fs 288063	2.76-3.00	0.05	0.700-0.900	0.40-0.75
Fs 313063	3.01-3.25	0.05	0.700-0.900	0.40-0.75
Fs 338063	3.26-3.50	0.05	0.700-0.900	0.40-0.75

Cl Phosphorus 0.035 Per Cent Maximum

This class of pig iron, generally called special low phosphorus charcoal iron, is made by warm blast practice with charcoal fuel. It is used for special purposes such as roll manufacture.

Table 10

Grade Designation	Si	S Max.	P Max.	Mn
C1 063053	0.50-0.75	0.035	0.035	0.40 max.
C1 088053	0.76-1.00	0.035	0.035	0.40 max.
C1 113053	1.01-1.25	0.035	0.035	0.40 max.
C1 138053	1.26-1.50	0.035	0.035	0.40 max.
C1 163053	1.51-1.75	0.035	0.035	0.40 max.
C1 188053	1.76-2.00	0.035	0.035	0.40 max.
C1 213053	2.01-2.25	0.035	0.035	0.40 max.
C1 238053	2.26-2.50	0.035	0.035	0.40 max.
C1 263053	2.51-2.75	0.035	0.035	0.40 max.
C1 288053	2.76-3.00	0.035	0.035	0.40 max.
C1 063078	0.50-0.75	0.035	0.035	0.40-0.60
C1 088078	0.76-1.00	0.035	0.035	0.40-0.60
C1 113078	1.01-1.25	0.035	0.035	0.40-0.60
C1 138078	1.26-1.50	0.035	0.035	0.40-0.60
C1 163078	1.51-1.75	0.035	0.035	0.40-0.60
C1 188078	1.76-2.00	0.035	0.035	0.40-0.60
C1 213078	2.01-2.25	0.035	0.035	0.40-0.60
C1 238078	2.26-2.50	0.035	0.035	0.40-0.60
C1 263078	2.51-2.75	0.035	0.035	0.40-0.60
C1 288078	2.76-3.00	0.035	0.035	0.40-0.60
C1 063088	0.50-0.75	0.035	0.035	0.60-1.00
C1 088088	0.76-1.00	0.035	0.035	0.60-1.00
C1 113088	1.01-1.25	0.035	0.035	0.60-1.00
C1 138088	1.26-1.50	0.035	0.035	0.60-1.00
C1 163088	1.51-1.75	0.035	0.035	0.60-1.00
C1 188088	1.76-2.00	0.035	0.035	0.60-1.00
C1 213088	2.01-2.25	0.035	0.035	0.60-1.00
C1 238088	2.26-2.50	0.035	0.035	0.60-1.00
C1 263088	2.51-2.75	0.035	0.035	0.60-1.00
C1 288088	2.76-3.00	0.035	0.035	0.60-1.00

(To be continued)

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Man-to-Man

ON THE MOLDER'S BENCH

"Experting Away From Home"

By RALPH L. LEE

I'VE noticed that the farther I get away from home the more foundry folks listen to what I have to say. This makes it nice for me because most of my foundry visits are made where they don't know me very well and where I get away before they have had time to try out my suggestions.

But anyway, I do think we all ought to get out and around more. With the old nose so close to the grindstone, everything gets so dog-gone common. We get common to the gang and the gang gets common to us. We even get common to ourselves.

I was talking about this to a very good friend quite some time ago, a fellow who runs a good sized foundry. He said he just had to get out every now and then or go plumb to pot. About once a year he swaps visits with an old pal who runs a foundry just about like his.

"To hear us talk," he told me, "a person would think neither one of us was very proud of the company we kept. A lot of ribbing goes on, bordering on downright insult, polished off with considerable bragging and belittlin'."

A devilish twinkle came into his eye when he told me the last visit between the two. "He and I were walking down through his foundry, with him shootin' off every step of the way, when I stopped suddenly to watch one of his boys pouring off with a hand ladle. Well for the love of Pete," I said, "do you mean to tell me that you don't even have ladle covers?"

"What the hell's wrong with that?" he snapped back at me. "George!" I said, shaking my head, "I always did know you were naturally backward, but I'm a son of a gun if I ever dreamed that even you would stick to your old ox-cart ways, when anyone who knows anything about the foundry has learned long ago that hand ladles must be covered."

My friend said that they quit their kidding at this point, with his pal admitting that he had thought about covers for quite some time, but with this and that he just hadn't gotten around to doing something about it. My friend told his pal where he could get the dope, in fact promised to send him some prints on exactly how to go about the job.

It turned out that after all the ladles were covered and everybody enthusiastic about the deal my friend's pal returned the visit, coming on over to spend the day with him.

"I'll never forget the look on my pal's face," my friend said, "when, on our trip down through my foundry we came up to the first of my boys pouring out of a hand ladle. He stopped dead in his tracks and sneered through his teeth, "Why you low-down, good for nothing hypocrite—here you come up to my place and make me feel like a backwoods heel because we don't have covers on our ladles, while you—you crooked so and so—still don't have them on yours."

I have heard since that this is one of my friend's prize stories which he tells to almost any one he likes and who will listen. I imagine he has had to put covers on his ladles by this time, although I really can't say for a fact. I'll say this though, I'm planning to put covers on my two ladles just as soon as I can get around to it; in fact, I decided to do it when my friend told me his story over a year ago. After all, with the lid keeping the metal hot, the ladle ought to go farther on one filling to say nothing of the metal behaving better down in the molds.

But be this as it may, I think a person for his own and others' good just must get away from the old diggings and browse about in other foundries. From my own personal experience, doing so much visiting, I'd say that I haven't been through a foundry yet, no matter how small, where I didn't come away with some thought that was bound to pay off later. Then too, I like to feel that maybe I've left some little idea or suggestion behind that will help pay my host for the trouble I've caused him.

To my way of thinking there is still another advantage to gadding about a bit, just as important as leaving and bringing back ideas—it's getting some backing on the things we already know are so. Once in a while, at least, I come away from one of these visits, one quite some distance from home, with the feeling that maybe I'm not such an amateur after all and ought to speak my piece oftener at home. It shames me once in a while into getting things done I'd planned to do.

On the other hand, even though you couldn't trace one specific idea to the visit it does give your folks a vacation from you and vice-versa and makes the old place kind of nice to get back to.

By the way, I've been doing a little experimenting with a little insulation between the inside of my hand ladle and the lining. While it cuts down some on iron the iron sure stays hot. Wait till I get the cover on too; I'll betcha we'll have something.

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MALLEABLE FOUNDERS' SOCIETY

Holds Industry Meeting at Cleveland

By FRANK G. STEINEBACH
Editor
THE FOUNDRY

REPORTS of committees and consideration of the future of the malleable foundry industry featured a general meeting of the Malleable Founders' Society, held at Hotel Cleveland Sept. 24. Collins L. Carter, president-general manager, Albion Malleable Iron Co., Albion, Mich., and president of the society, presided.

Announcement was made that the new cost manual of the society had been approved by the board of directors, and shortly would be sent to the membership. John A. Wagner, president, Wagner Malleable Iron Co., Decatur, Ill., and chairman of the society's cost committee, pointed to the need for management to take an interest in this new manual.

Discuss Allocation Efforts

Dudley V. Walker, managing director, Eberhard Mfg. Co., division of Eastern Malleable Iron Co., Cleveland, and chairman of the committee on government relations and controls, reported on several activities of that committee. He discussed the protest that was filed in connection with the voluntary allocations program on pig iron, and also reported on the action that was taken in connection with the Republic-Kaiser Frazer-War Assets Administration deal to help foundries in their fight to maintain a supply of pig iron. Mr. Walker emphasized the need for giving greater attention to the problem of accelerating the government program of returning scrap metal from abroad.

Harry M. Laws, vice president, New Haven Malleable Iron Co., New Haven, Conn., and chairman of the membership committee, reported for that group. As a result of changes in the by-laws made at the annual meeting in June, seven Canadian foundries have joined the society.

President Carter stated that several changes have been made in the organization of the staff. Lowell D. Ryan, managing director of the society, also has been elected secretary. L. A. Dibble, president, Eastern Malleable Iron Co., Naugatuck, Conn., has been elected treasurer, and Ruth M. Bodell, who has been a member of the national office staff of the society for a number of years, was named cashier.

James H. Lansing, technical and research director of the society, stated that the research committee has prepared an active program for the coming year. Shop practice meetings have been arranged, and the first round will deal with "Adjustments in Direct and Duplex Melting Necessitated by Metal Shortages." He also reported on some preliminary tests which have been made to determine the effect of cerium on malleable iron. While additions of cerium in the form of mischmetall resulted in some reduction in sulphur, the results were not sufficiently conclusive, and the study will be continued.

Col. E. C. Langmead, Munitions Board, Washington, discussed "Munitions Board Industrial Mobilization Planning." He described the organizational plan of the National Security Organization, and discussed in particular the functions of the National Security Resources Board and the Munitions Board. As explained by Colonel Langmead, the NSRB is charged with advising the President concerning the co-ordination of military, industrial and civilian planning. The Munitions Board is charged with co-ordinating with regard to industrial matters the procurement, production and distribution plans of the departments; planning for the military aspects of industrial mobilization; and determining the relative priorities of the various segments of the military procurement programs. Colonel Langmead discussed the advisory committees, including the Foundry Industry Advisory Committee, which are being set up by the Munitions Board and the NSRB.

Lowell D. Ryan, managing director of the society, told the group of some observations he had made in the course of visits to malleable foundries in eight states. Conversations with management indicated unanimous agreement that the society is giving great value, especially in bringing members together and giving the opportunity of becoming better acquainted and exchanging ideas on a wide variety of subjects.

The industry is concerned with the pig iron and scrap price and supply problems. Voluntary allocations of pig iron do not appear to have hurt the industry, and an improved situation is anticipated through gradual increases in imports of foreign iron and improvement in domestic iron production. Some progress is indicated in the return of scrap from Europe and the Pacific.

Manpower continues a pressing problem for the industry. While much has been done in the modernization and mechanization of plants, management seems aware of the need for further efforts in that direction.

While difficulties in getting help and raw materials have been a factor, it appears that, by and large, production of malleable castings has been rather static when compared with postwar production of numerous other industries. Mr. Ryan expressed the opinion that an industry which produces such important components for basic industries cannot but hope for constantly expanding markets. Such a program ties in with the movie which already has been authorized by the society, and with the entire broad subject of publicity and public relations. These are subjects which require careful and intelligent planning.

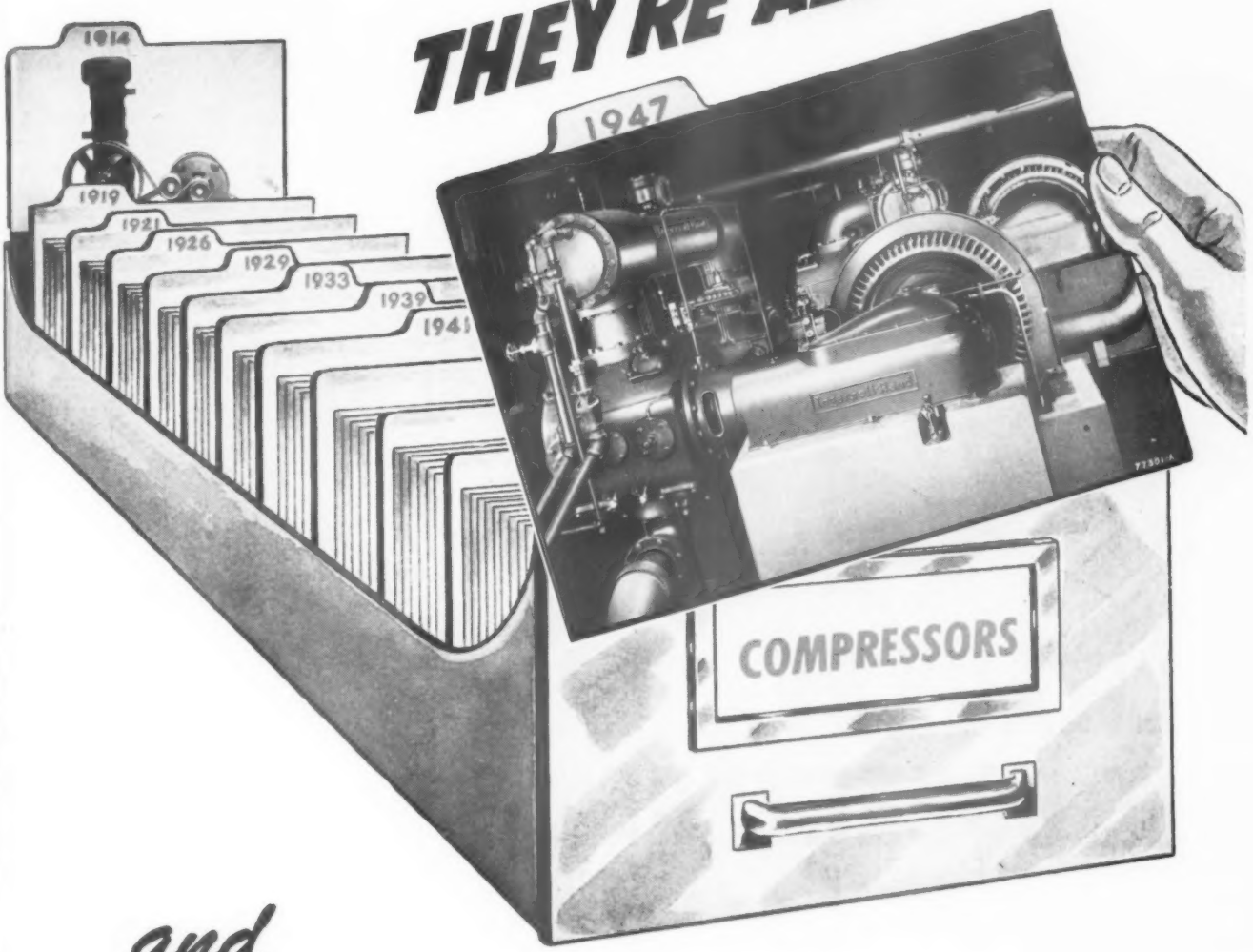
Consider Customer Analysis

A. A. Sommer, McCann-Erickson Inc., Cleveland, advertising agency, presented some ideas on advertising and market research, as applied to the industry. Reminding the founders that effective marketing research has been done under sponsorship of trade or manufacturers' associations like their own society, he suggested the consideration of customer analysis as to volume, type and location. Important subjects for industrial executives and their consultants to consider are basic industrial location factors, population and per capita income changes which reflect shifts in industry location, he stated. Through co-operative endeavor, much educational work can be done and should be undertaken by the industry to publicize malleable iron. The speaker pointed out that the best way for an industry to cope with outside competition is to join forces and face it with a united front.

An interesting paper, "Selecting a Material To Do a Job," by D. R.

(*Concluded on page* 133)

THEY'RE ALL I-R



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ALL OPERATING TODAY!

34 YEARS of trouble-free service...and still in daily use. That's the record of a Wisconsin manufacturer's first Ingersoll-Rand compressor, installed in 1914.

Many times since then more capacity was needed. Each time another compressor was installed it was an I-R. Today there are 12 of them, newest of which are three Type XRE, direct-connected, synchronous-motor-driven units. From experience, this manufacturer knows that Ingersoll-Rand compressors are economical, dependable, and long-lasting.

It is interesting to note that all these compressors were purchased through the same I-R Engineer. In each case his knowledge and experience played a major part in the selection of the proper machine for the job.

When you need Air-Power, let one of our trained engineers give you the same help with your problems.

COMPRESSORS • AIR TOOLS
ROCK DRILLS • TURBO BLOWERS
CONDENSERS • CENTRIFUGAL PUMPS
OIL AND GAS ENGINES

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MOLD YOUR FOUNDRY'S *Future*

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MILWAUKEE JOLT SQUEEZERS

MILWAUKEE JOLT SQUEEZER STATIONARY TYPE
No. 103 with 10" diameter squeeze piston. Exerts a squeezing pressure of 6,200 lbs. at 80 lbs. line pressure. Overall height 64".

The future of your foundry depends largely on the type of equipment you use. Are your machines modern and efficient? Do they reduce costs to rock bottom? Will they stand up under strenuous production schedules?

Foundrymen employing MILWAUKEE Jolt Squeezers face the future with confidence. For these dependable molding machines are built for rugged service and are easy to operate. Designed to maintain the original parallelism between platen and table, there is no need to worry about ram-offs. The machine produces BETTER MOLDS in LESS TIME. Upkeep is low because renewable surfaces are provided at wearing points to simplify and reduce maintenance.

IMMEDIATE DELIVERY—Both 10" and 12" Jolt Squeezers are available for immediate shipment. Write today.

MILWAUKEE JOLT SQUEEZER PORTABLE TYPE
No. 124 equipped with knee operated jolt and vibrator valves, 12" squeezing piston, steel wheels and mold shelf.

***New* EASY CREDIT TERMS!**
All Milwaukee Foundry Equipment may now be purchased on convenient credit terms. Write for complete details.

MILWAUKEE *Foundry Equipment Co.*

3238 W. PIERCE STREET, MILWAUKEE 4, WISCONSIN, U.S.A.

(*Concluded from page* 130)

Meier and J. H. Crankshaw, design engineers, Locomotive & Car Equipment Division, General Electric Co., Erie, Pa., as presented by Mr. Meier, outlined considerations which must be studied in making the decision on any design. Those which apply quite generally include safety, reliability and availability, reasonable cost, size, weight, economical operation, low maintenance, long life, freedom from nuisance objection, and good appearance.

In deciding the functional requirements of certain parts, numerous questions must be answered, including the following: What is the load on the part? Does the part carry electric current, magnetic flux, or perform some special function? Will it be subject to wear and is material hardness a factor? Does it have to be light weight? What will be the operating temperature? Need it be corrosion-resistant? If it fails, is it difficult to replace? Are special manufacturing properties required such as weldability, formability? Many of these questions can be answered immediately but the factor of load cannot be correctly evaluated in the design stage in many instances. Quite frequently it takes service experience to produce some ideas of the values of the load. The speaker illustrated his point by discussing the load produced on a traction motor used by a main line locomotive, and illustrated in No. 31 of "Malleable Iron Facts" published by the Malleable Founders Society.

Depends on Several Factors

Wear of metallic materials depends upon such factors as the pressure on the rubbing surfaces, the rate of sliding, character of materials, degree of lubrication, atmospheric conditions, etc. It was pointed out that fatigue is one of the most severe problems confronting the machine designer. Metallic materials fail in fatigue when the load is of a pulsating nature such as to induce stresses above the endurance limit of the material. While endurance limit of a material can be established by tests of simple shapes under controlled conditions of loading, temperature, etc., it is not easy to apply these tests to actual machine parts. The following manufacturing operations were indicated as having a tremendous influence on the fatigue stength of a part: The kind of heat treatments, the surface finish, residual stresses due to heat treatment, cold or hot working, cold straightening, welding, and corrosive action due to use of chemicals or to atmospheric conditions.

The authors pointed out that malleable iron has many advantages as an engineering material. Among these are good machinability, low cost, ease of casting and good physical properties. Malleable iron holds its dimensional accuracy very well because of low residual stresses. It was emphasized that the organization with which the authors are connected depends on the foundryman and the patternmaker to obtain experience in the design of castings. These people are consulted before detailed drawings are made so that all ideas can be incorporated in the design. This method makes for lower cost, better quality castings and more satisfied customers.

Meeting Calendar

Nov. 4-5—Metals Casting Conference, Purdue University, West Lafayette, Ind.
Nov. 4-5—Industrial Management Society, 12th annual national time and motion study clinic, Sheraton Hotel, Chicago
Nov. 5—Malleable Founders' Society, eastern sectional meeting, New York
Nov. 11-13—Mechanite Casting Manufacturers, annual meeting, Pittsburgh
Nov. 15-16—Steel Founders' Society of America, fall meeting, Hot Springs, Va.
Nov. 18-19—National Founders' Association, annual meeting, Sheraton Hotel, Chicago
Nov. 19—Malleable Founders' Society, western sectional meeting, Palmer House, Chicago
Dec. 2-4—American Institute of Mining and Metallurgical Engineers, Electric Furnace Steel Committee, annual conference, Hotel William Penn, Pittsburgh
Dec. 2-4—Society for Experimental Stress Analysis, Annual meeting, Hotel Commodore, New York.

1949

Jan. 10-14—Materials Handling Exposition, Philadelphia
Jan. 14—Malleable Founders' Society, semi-annual meeting, Hotel Cleveland, Cleveland
Jan. 24-25—Industrial Furnace Manufacturers Association, meeting, Cleveland
Feb. 9-10—Steel Founders' Society of America, annual meeting, Chicago
Feb. 10-11—Regional Conference, Wisconsin Chapter of AFS, Milwaukee (Tentative)
Feb. 17-19—Regional Conference, Birmingham Chapter of AFS, Birmingham
Feb. 25—Malleable Founders' Society, western sectional meeting, Palmer House, Chicago
Feb. 28-Mar. 4—American Society for Testing Materials, committee week, Edgewater Beach Hotel, Chicago
Mar. 4—Malleable Founders' Society, eastern sectional meeting, New York
Mar. 11-12—Ohio Regional Conference, sponsored by Ohio AFS Chapters, Ohio State University, Columbus, O.
Mar. 25—Malleable Founders' Society, western sectional meeting, Palmer House, Chicago
Apr. 11-15—American Society for Metals, sixth Western Metal Congress and Exposition, Shrine Auditorium, Los Angeles.
Apr. 18-20—American Institute of Mining and Metallurgical Engineers, National Open Hearth Steel Committee annual meeting, Palmer House, Chicago
Apr. 22—Malleable Founders' Society, western sectional meeting, Palmer House, Chicago
May 2-5—American Foundrymen's Society, annual convention, St. Louis
May 20—Malleable Founders' Society, eastern sectional meeting, New York
May 27—Malleable Founders' Society, western sectional meeting, Palmer House, Chicago
June 16-17—Malleable Founders' Society, annual meeting, Homestead Hotel, Hot Springs, Va.
June 27-July 1—American Society for Testing Materials, annual meeting, Hotel Chalfonte-Haddon Hall, Atlantic City, N. J.
Oct. 10-14—American Society for Testing Materials, Pacific Coast meeting, Fairmont Hotel, San Francisco

Battelle Plans New Laboratory

To house additional laboratories required for its expanding research, Battelle Institute, Columbus, O., plans immediate construction of a new half-million-dollar laboratory building, scheduled for completion in 1949. Major addition will be the largest of recent laboratory structures erected by the institute and will be built of concrete and steel, with brick veneer finish.

The building will be erected on Seventh Ave., Columbus, adjacent to the present site. The three-story structure will contain space for 103 unit laboratories, plus large open areas for pilot-plant operations and will contain approximately 80,000 sq ft of space, bringing total floor space of the institute to approximately one-half-million square feet.

Book Review

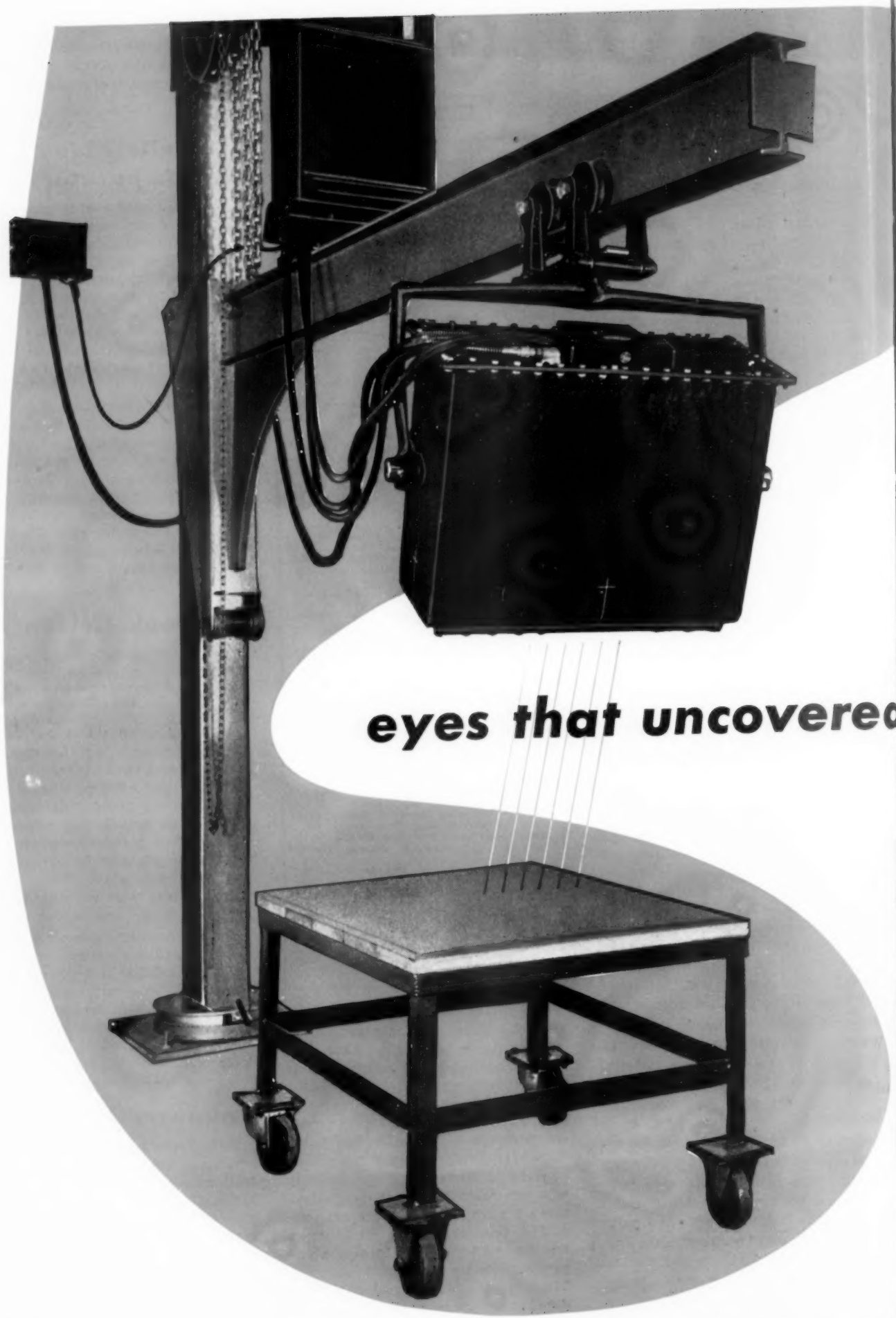
Design of Metal Cutting Tools, by Frederic L. Woodcock, cloth, 406 pages, 6 x 9 in., published by McGraw-Hill Book Co. Inc., New York. Price $5.

Intended as an aid to tool designers, draftsmen, shop foremen, superintendents and others, in the profitable and efficient design of all metal cutting tools, this handbook is based on actual shop experience. It shows the practical application of tool to the job, how to salvage worn out tools and adapt them to new uses, and how tools are made to function accurately and economically.

It discusses fundamentals of design, and spotlights practical procedures and easy-to-follow instructions on the design of broaches, cutters, drills, hobs, punches, dies, reamers, and other tools. Many illustrations are used to bring out important details of all tools discussed.

Employee Magazines

Policyholders Service Bureau, Metropolitan Life Insurance Co., One Madison Ave., New York 10, has published a report "Contents of 399 Employee Magazines. It analyzes the material which industrial editors throughout the United States and Canada are using today in an effort to create better informed and more co-operative employees.


eyes that uncovered

• As an inspection device, industrial x-ray is a swift substitute for physical test and sectioning. But its applications are much broader.

• For General Electric Industrial X-Ray has become a *development* tool. It not only diagnoses, but suggests treatment. It shows where savings can be made, designs improved, new techniques developed.

• General Electric X-Ray Corporation leads the way in shaping the forces of electronics to every industrial need. There are industrial x-ray units for visual inspection of light metal castings, packaged goods and small assemblies. Other G-E X-Ray units tell a story of economy for the heavy metal industry. And G-E Diffraction units analyze metals, chemicals and metal alloys at a cost lower than by any other method.

$35,000 a month in a scrap heap

THE complicated design of a 40-pound flywheel housing meant trouble for the foundry. Too many flaws showed up in too many castings. 12 out of each 100 ended as scrap. Resulting losses were heavy. Even more serious were delays in deliveries.

Stepped-up production, at that time, was out of the question. Management looked again at the rusting scrap heap. Could the rejected parts be salvaged?

Welding was an answer. Flaws were burned out and the metal filled in. But were the welded castings as sound? And, if so, could the customer be convinced?

The foundry's General Electric Industrial X-Ray unit made "portraits" of the two types of castings showed the one equal in quality and soundness to the other. The films convinced the customer.

Deliveries got back to normal. $35,000 a month in castings was plucked from the scrap heap. A 20% saving was passed on to the customer. Industrial x-ray once again more than paid for itself on the first assignment.

In the casting of steel and the molding of plastics; on scores of assembly lines, G-E Industrial X-Ray curbs waste, speeds production, helps build better goods. Is there a place for industrial x-ray in your business? A General Electric X-Ray engineer will be glad to talk it over. Write or wire. General Electric X-Ray Corporation, Dept. K-37, 4855 McGeoch Ave., Milwaukee 14, Wisc.

GENERAL ELECTRIC X-RAY CORPORATION

• General Electric X-Ray Corporation manufactures and distributes x-ray apparatus for industrial, dental and medical use; electromedical apparatus; x-ray and electromedical supplies and accessories.

AROUND Detroit

Car and truck assemblies are running comparatively smoothly . . . Work is being done on Army air-cooled engine . . . Oldsmobile high compression engine is unveiled

By A. H. ALLEN
Detroit Editor
THE FOUNDRY

PASSENGER car and truck assemblies are again running comparatively smoothly, and at a level which points toward 1948 output of close to 5,500,000 units. Supplies of cast iron engine components, for many manufacturers touch and go most of the summer, are once more back in the groove although the larger production foundries are being pushed for shipment of everything they can turn out. Quality of materials and parts, generally speaking, continues to be inferior. Foundries, for example, are still faced with scrap which has subnormal metallics per pound of weight, off-grade pig iron, and inconsistent coke quality. However, there is hope for early improvement. As James D. Mooney, president of Willys-Overland, told a press group in Toledo recently, "After all, quality could not get much worse."

Foundries Slowing Down

Tool and die programs for 1949 models are pretty well cleared up as far as foundries are concerned, and a number of the local gray iron shops are operating on reduced draft. Combination of the usual seasonal drop in tool and die work with slow demand for castings from machine tool builders is making the going a little rough for some jobbing foundries.

Naturally considerable interest attaches to the 1949 passenger car models which have been and are about to be announced. New Kaisers were unveiled Sept. 20, followed by the new Frazers on Oct. 18. Both feature engines in which horsepower has been boosted 12 per cent, with no accompanying increase in fuel consumption. The step-up was effected by the adoption of dual manifolding and a dual-throat carburetor which provide more efficient distribution of fuel to all cylinders. Compression ratio of 7.3:1, claimed to be the highest among standard mass-produced automobiles, has been retained. A number of other engine improvements have been devised, including 9 per cent more cooling obtained by new shrouding around the radiator core; three-point rubber engine mountings; improved tappets; more efficient crankcase ventilation and better accessibility through the use of new splash shields.

Both the Kaiser and Frazer have considerably altered outward appearance, although basically the bodies have not been retooled. Radiator grilles have been entirely redesigned. Bright metal moldings have been added to liven up highlights, and dozens of new color combinations have been concocted. Present body types are confined to the four-door sedan, although shortly a new convertible style will make its appearance, as well as what has been termed a "hard-top"—a standard type of steel-roof sedan over which fabric and padding have been stretched to give a novel appearance.

K-F engines continue to be built principally at the engine plant in Detroit leased from Continental Motors Corp. Blocks and heads come mainly from Wilson Foundry at Pontiac, a Willys-Overland subsidiary, while the K-F foundry division at Dowagiac concentrates on smaller gray iron castings.

Continental Motor's Detroit operations now are confined to a small engineering laboratory, all production work being handled at Muskegon. An important engine order now on the books is for 4-cylinder power plants to be installed in the Ferguson tractor which is being assembled at a new plant recently completed in Detroit. First tractor came off the line there Oct. 11, after a whirlwind program of building a plant and buying the necessary assembly equipment. Virtually all components will be furnished by outside manufacturers, and are standard automotive items. Ferguson is hoping to give Ford a run for his money in the tractor field, despite the fact Ford is pumping out nearly 2500 tractors a week into the Dearborn Motors Corp. distributing organization.

A group of air-cooled engines under development since 1943 for Army Ordnance recently was shown by Continental. Designed primarily for military use where high horsepower with minimum weight and bulk are first considerations, the engines still should prove to have commercial possibilities. The line ranges from 125 to 1040 hp, the 250-hp unit, for example, weighing only 777 lb, compared with 2400 lb for a liquid-cooled engine of similar horsepower. Comprising cast aluminum crankcases, with forged steel cylinder barrels over which finned aluminum muffs have been bonded and cast aluminum cylinder heads, the engines are built in either flat or V-types.

Ordnance Officials Pleased

Only two basic cylinder sizes are used, 4⅝ and 5¾-in. diam, in each of which all parts are interchangeable. Differences in power are obtained by increasing the number of cylinders or by stepping up the compression ratio. Ordnance officials are enthusiastic over the power plants for installation in tanks and transport vehicles; for one reason because, unlike liquid-cooled engines, they can be operated satisfactorily in extremes of climate, and for another reason because standardization of parts has greatly simplified the maintenance problem. Cost of manufacture has been estimated to be about on a par with liquid-cooled jobs if figured on a per-horsepower basis, considerably more if figured on a per-pound basis. A possible objection from a commercial user might be the somewhat greater noise involved in operation of the air-cooled units, although Continental engineers say this difficulty could be minimized if commercial applications were imminent. For the present, the engines are strictly Ordnance projects and are still in the experimental stage, no production orders having been released as yet.

Wraps were taken off the Oldsmobile V-8 high high-compression type of engine, revealing some slick casting jobs in gray iron, particularly the compact V-8 block and the intake manifold which fits into the center of the Vee. The latter is an intricately cored casting, with individual arms leading to the intake ports on either side, and a cored passage at the front carrying water from the cylinder block to the radiator inlet.

Basically the valve-in-head V-8 is a high compression design although at the start ratio will be only 7.25:1, since the necessary premium fuel for higher ratios is not yet available

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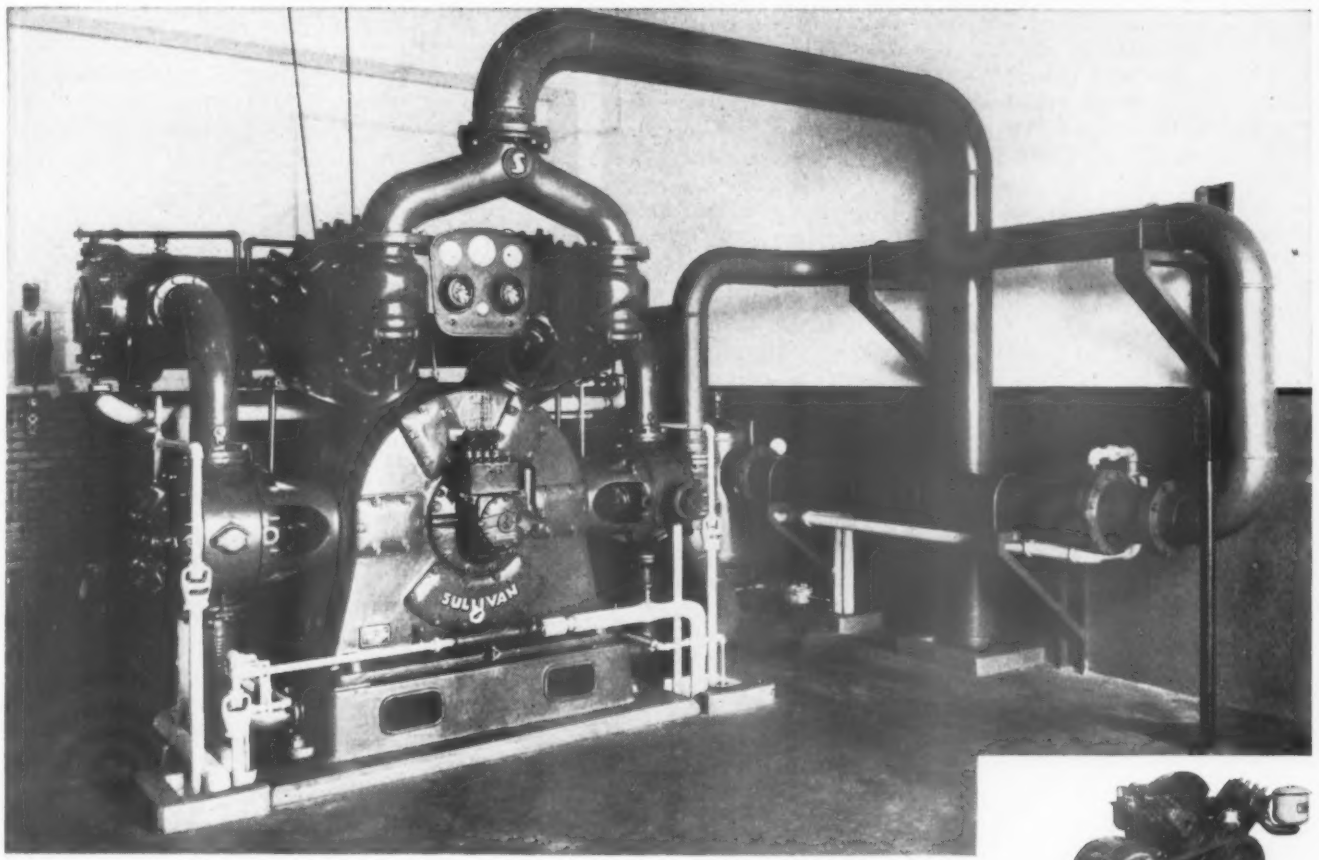
High Air Capacity . . . Unmatched in

LOW AIR COST

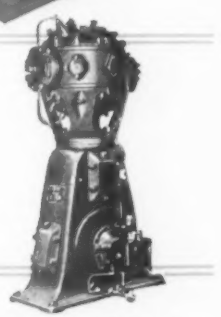


JOY WN-114 COMPRESSOR

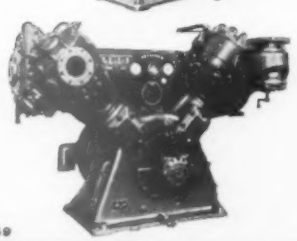
The JOY WN-114 is a four-cylinder, two-stage, double-acting compressor producing 1092 to 3656 CFM in single units, and up to 7312 CFM in twin units, depending on pressure. Exclusive "Dual-Cushion" valves provide top efficiency in low-cost air power. ● JOY builds the most modern compressors available for either centralized or decentralized air supply—*write for Bulletins.*

Consult a Joy Engineer

The JOY WL-80, in 9 sizes from 81 to 590 CFM.



The JOY WG-9, in 11 sizes from 153 to 822 CFM.



The JOY WN-112, in sizes from 378 to 1828 CFM.

W&D 12059

JOY MANUFACTURING COMPANY

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IN CANADA: JOY-SULLIVAN OF CANADA, LIMITED, GALT, ONTARIO

(*Concluded from page* 136)

generally throughout the country. Compression can be stepped up easily toward the optimum peak of 12.5:1 by changing the cylinder head. The necessary rugged block, five main bearings, shorter stroke and slower piston speeds which reduce friction losses and permit absorbing the high explosion pressures of the 12.5:1 ratio engine, are basic elements of the design. Net gain in mechanical efficiency of the unit, against the former L-head straight eight is estimated to be 4 per cent. Horsepower is up from 115 to 135; displacement is increased from 257 to 304 cu in. The engine is 10 in. shorter than the 43-in. straight eight, and appears to be one of the most compact power packages yet worked out by the industry's engine specialists.

All Machinery Painted Green

The $10 million plant equipped by Olds to build the engine at a rate of 30 an hour, essentially a vast automatic machine shop, is one of the marvels of the metalworking industry. Blocks, heads, manifolds, pistons (cast aluminum), connecting rods and other components are fed into elaborate batteries of intricate transfer-type machine tools and pass automatically through a dozen or more machining stations, are gaged automatically, and delivered to assembly points without hardly a hand being placed on them. Chip conveyors are located beneath the floor. An air cleaning system, costing $750,000, handles 164,000 cfm, and passes a steady stream of washed air to all parts of the manufacturing area. All machinery and equipment is painted a light green.

Nash announced its 1949 models formally Oct. 21, their most unusual features being new bodies and fenders which are brought down over both front and rear wheels to the sill line. A 3-in. reduction in the front tread was necessary to permit turning the wheels inside the fender housings, and this at the same time permits shortening the turning radius by a couple of feet.

Buick's '49 stuff was displayed to the press Oct. 18, being highlighted by new bodies for the series 50 and 60 models, elimination of the series 40 model, and adoption of the Dynaflow transmission on the 50 as well as the Roadmaster series.

Cadillac scheduled its showing Oct. 22, and the 1949 line will spotlight the second of General Motors' high-compression V-8s, rated at 165 hp. No changes have been made in the basic body design, although numerous decorative and style innovations were shown.

OBITUARY

ANDREW D. SMITH, 67, for more than 20 years associated with Bethlehem Steel Co. in Cleveland, died in Lakeside Hospital, Cleveland, Sept. 26. At the time of his retirement a year ago, Mr. Smith was foundry advisor. Concurrently he had been metallurgical consultant for numerous steel companies and foundries, and was an officer of National Metal Abrasive Co., Cleveland. A short time ago he became treasurer and general manager, Furnace Reconstruction Co., Cleveland, a company organized to specialize in brickwork and furnace construction on

ANDREW D. SMITH

openhearth, reheating, cupola and blast furnaces. Mr. Smith was a member of the Northeastern Ohio Chapter of the AFS.

* * *

Gordon T. Williams, since 1944, research metallurgist, Pratt & Whitney Aircraft Division, United Aircraft Corp., Hartford, Conn., died Sept. 19, in Hartford Hospital, Hartford, Conn. A native of Cleveland, Mr. Williams was associated with Cleveland Tractor Co. for 9 years as metallurgist. In 1939 he left that position, upon his appointment as metallurgist, testing and research laboratories, Deere & Co., Moline, Ill., where he remained for 5 years. Mr. Williams was a member of the American Foundrymen's Society and other technical organizations, including American Society for Metals, serving as chairman of its Cleveland Chapter in 1937.

* * *

Aldus C. Higgins, 75, since 1946, chairman of the executive committee, Norton Co., Worcester, Mass., died at his home there, Sept. 10. Mr. Higgins was graduated from Worcester Polytechnic Institute and National University Law School, Washington, acting as assistant examiner in the United States Patent Office while studying law. In 1900 he was appointed patent counsel, Norton Co. of which his father was a founder. He was named president and general manager of the company in 1933, and served as chairman of the board of directors from 1941 to 1946. For his invention of a water-cooled electric furnace which made possible the commercial production of Alundum abrasive he was awarded the John Scott Medal by Franklin Institute in 1913.

* * *

Julius Thomas, 59, for 37 years a foreman at Ohio Foundry Co., Cleveland, died July 26, following an illness of 2 years. Mr. Thomas was associated with the foundry industry in Cleveland for 45 years. He began as an apprentice at Ferro Machine & Foundry Co., later working at Allyne-Ryan Foundry Co., as a coremaker. He was a member of the Northeastern Ohio Chapter of the AFS.

* * *

Herbert T. Schmeller, 45, formerly secretary-treasurer, Schmeller Aluminum Foundry Inc., Cleveland, died at his home there, Oct. 5. Mr. Schmeller was secretary of the National Bronze & Aluminum Co., Cleveland, during the time his father, the late John Schmeller, was president. When the present company was formed by Mr. Schmeller and his brothers, he became secretary-treasurer.

* * *

John Eckels, superintendent, Erie Bronze Co., Erie, Pa., died Sept. 20 at his home there. Mr. Eckels entered the foundry industry over 50 years ago, beginning his career with Mesta Machine Co., Pittsburgh. From 1912 to 1930, when he joined Erie Bronze Co., he was associated with General Electric Foundries, Erie Pa., where he became superintendent.

* * *

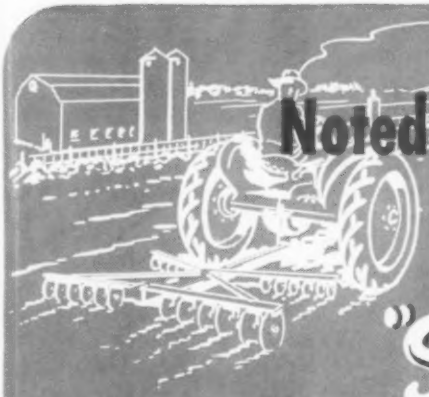
Otto E. Steep, 69, district manager of the St. Louis office of Sterling Wheelbarrow Co. for the past 26 years, died Sept. 20. Mr. Steep was born in Chicago and joined the company office there in 1917. He was appointed St. Louis district manager five years later.

* * *

Karl O. Schreiber, 56, vice president in charge of manufacturing, International Harvester Co., Chicago, died Oct. 5 in Evanston, Ill. He became associated with the company in 1917, and held various posts until elected vice president in 1941.

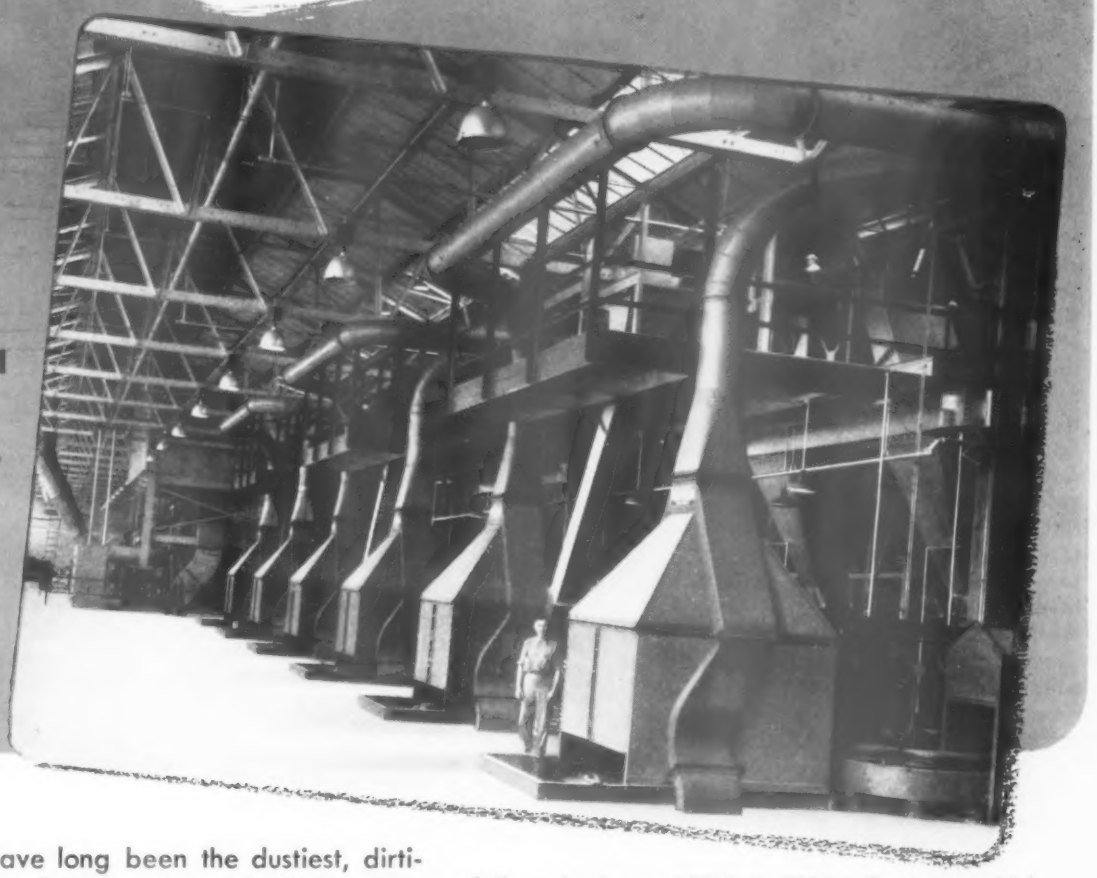
* * *

William L. Mayberry, superintendent and partner, Industrial Castings Co., Detroit died Aug. 21.



Noted farm equipment manufacturer "SHAKES" DUST PROBLEM!

"SHAKE-OUTS" EQUIPPED WITH KIRK & BLUM DUST CONTROL SYSTEM . . .



Shake-outs have long been the dustiest, dirtiest section of a foundry. Not so in this modern plant. Kirk & Blum installed these efficient "over-and-under" hoods which collect dust as it is released in the shake-out operation. In the photo above, six of the shake-out stations are seen. Piping is designed to meet AFA standards; note the cleanout doors and gasketed companion angle connections.

This installation is one of a number in the modern southern foundry of one of the world's largest farm implement makers. In other parts of the plant are KIRK & BLUM Systems which remove fumes, dust and chips from various operations.

From this and thousands of other installations in widely varying industries, KIRK & BLUM has gained great skill and knowledge, based on 40 years experience. This experience is at your service. Write for booklet, "Dust Collecting Systems in Metal Industries." The Kirk & Blum Mfg. Co., 2808 Spring Grove Ave., Cincinnati 25, Ohio.

FOR CLEAN AIR... THE INVISIBLE TOOL

KIRK AND BLUM
DUST CONTROL SYSTEMS

FOUNDRY Developments

By EDWIN BREMER

NODULAR graphite cast iron of superior physical properties has been produced by a southern foundry through a somewhat different method than the cerium-addition practice which has been developed by the British Cast Iron Research Association and publicized through the various papers of Morrogh (see p. 90 for the latter's most recent writing). Experimental work in this country indicates that magnesium not only has the same effect as cerium in replacing the normal flake graphite with a nodular structure, but it has certain advantages in properties obtained and applicability to low as well as high carbon irons. Most of the studies have been made using nickel-magnesium alloy as the additive agent. As an indication of results obtained, an addition of 1.25 per cent Mg boosted tensile strength of a normally 20,000-lb iron to 95,000 psi. With a subsequent one-hour anneal, irons of 70,000 psi or better and having unusual toughness have been obtained. Machining of these irons is said to present no problem. While the product still is in early development stages, it is regarded by some metallurgists as offering tremendous possibilities in broadening the application of cast iron as an engineering material. Announcement of the application of Mg as a spheroidizer in gray iron was made by International Nickel Co. Inc., in May.

* * *

EXCELLENT results have been obtained in the production of bronze and aluminum castings by using a plaster cylinder for the gate in order to maintain fluidity of the metal being fed into the casting. This cylinder is made up of plaster, a small amount of cement, a small amount of short-fiber asbestos and a drier to accelerate the setting of the plaster. The cylinder is produced by pouring a slurry into a split metal mold which has a removable center rod the diameter of the gate for which the collar is being produced. By watching the metal as it feeds to the casting through this plaster gate, and adding enough metal to keep the level in gate just above the casting, it is possible to feed a sizable casting with almost 100 per cent recovery. In using this collar for aluminum castings, the metal does not solidify along the sides but feeds down into the casting itself.

* * *

MODERN luminous paint is easy to apply to almost any surface usually found around the plant or home such as glass, metal, paper, wood or cloth. It can be brushed, sprayed, stenciled or screened to make signs, switchplates, fire extinguishers and other objects glow in the dark.

* * *

USE of an alkaline detergent in cleaning gray iron castings is described in the March-April issue of *Oakite New Service*, published by Oakite Products Inc., New York 6. Material is used in wet tumbling mills and hydroblast installations with the usual abrasive materials, and is said to provide an exceptionally clean surface on castings. It also is claimed that the detergent leaves a thin film on the castings which prevents rusting.

* * *

TO PUT themselves in sounder position to get needed steel, several large consumers have approached the War Assets Administration to examine the prospects for acquiring a surplus government-owned steel foundry either by lease or purchase. Their idea is to produce ingots which would be shipped to rolling mills for conversion into a number of products, mainly sheets and plates. The difficulty of obtaining both scrap and pig iron is understood to have been the main obstacle to putting one or more of these deals through.

* * *

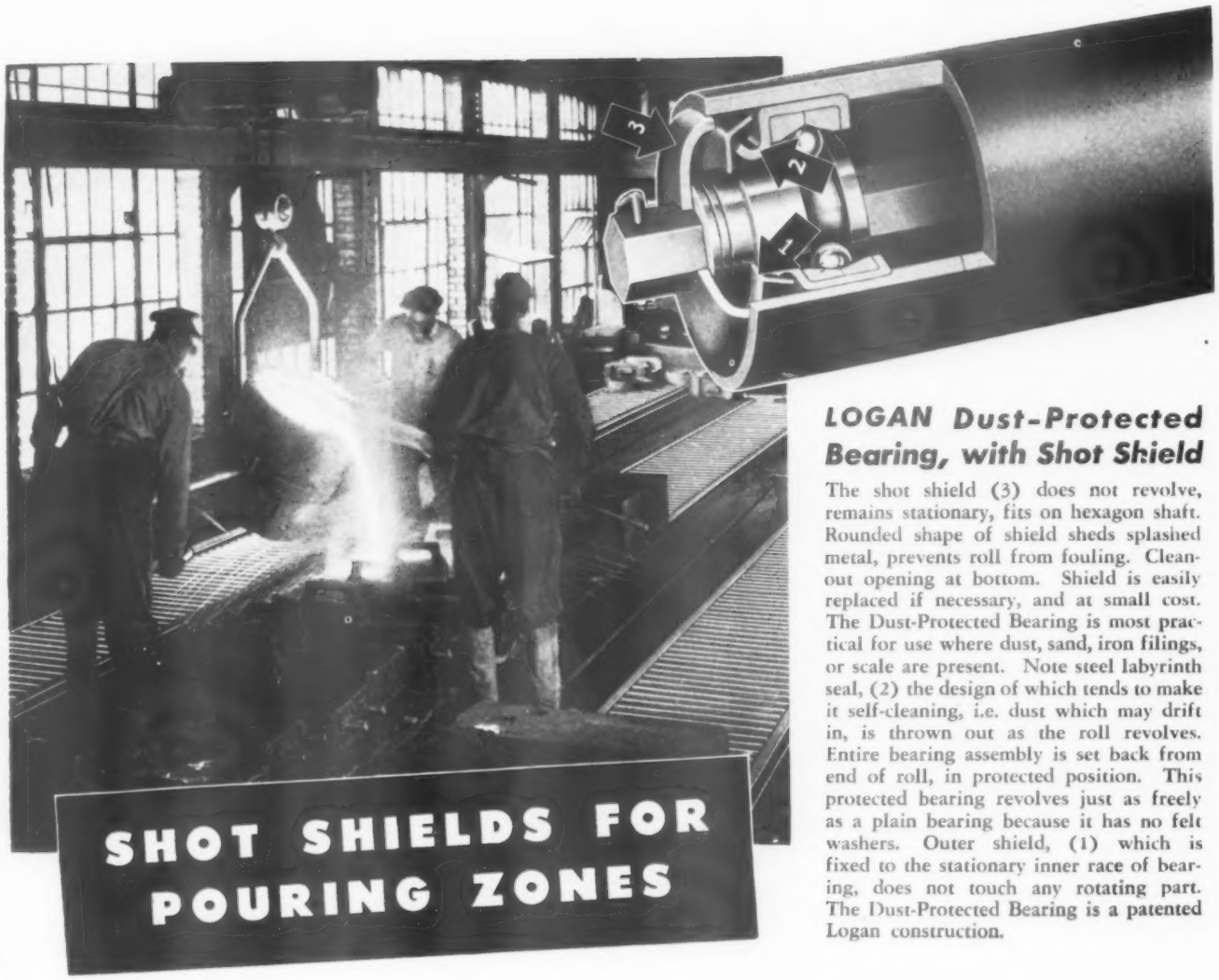
IMPROVED, portable instrument for determining adherence of porcelain to base metals has been announced by the Porcelain Enamel Institute, Washington. Designed along the same lines of the testing meter currently used, the new one is said to be considerably more rugged and compact, and is easily transported.

* * *

RECENT release by Carbide & Chemicals Corp., New York 17, states that a new non-solvent method of hydrolyzing ethyl silicate has been developed which eliminates the mutual solvent, thereby lowering cost and removing the fire hazard. Firm also states that royalties for investment casting with ethyl silicate as a binder have been reduced sharply, and that a new process for making commercial quantities of condensed ethyl silicate of uniform composition and low in color has been put into operation.

* * *

ACCORDING to R. G. McElwee in a paper presented at the summer meeting of SAE simple calculations show that the cooling rate of a wall is approximately that of a cylinder of twice the diameter. That is, 2-in. test bar will have same hardness as a casting 1 in. thick. This indicates that there are no satisfactory test bars for castings over 1½ in. thick although for practical purposes the 3-in. bar can be used as a pilot for castings 2 to 2¼ in. thick. It is accepted practice in making heavier castings such as dies, etc. to use arbitrary test bars which have been found experimentally to approximate the cooling conditions of the castings. Tension and other tests are usually made from one of the ASTM standard bars, and in a great many cases the engineer and foundryman have fallen into the error of using the 1.2-in. test bar for all sorts of work regardless of dimensions. This may be convenient from a testing standpoint, but unless the hardness of the bar approximates the hardness of the casting, this simplification of standards can be very misleading. For any repetitive casting which is very critical it may be necessary to establish arbitrary test bar diameters on an experimental basis if reasonably close control is desired.



SHOT SHIELDS FOR POURING ZONES

LOGAN Dust-Protected Bearing, with Shot Shield

The shot shield (3) does not revolve, remains stationary, fits on hexagon shaft. Rounded shape of shield sheds splashed metal, prevents roll from fouling. Clean-out opening at bottom. Shield is easily replaced if necessary, and at small cost. The Dust-Protected Bearing is most practical for use where dust, sand, iron filings, or scale are present. Note steel labyrinth seal, (2) the design of which tends to make it self-cleaning, i.e. dust which may drift in, is thrown out as the roll revolves. Entire bearing assembly is set back from end of roll, in protected position. This protected bearing revolves just as freely as a plain bearing because it has no felt washers. Outer shield, (1) which is fixed to the stationary inner race of bearing, does not touch any rotating part. The Dust-Protected Bearing is a patented Logan construction.

LOGAN ROLLS have features that count

For pouring zones, Logan recommends the use of shot shields on rolls, for added protection to bearings, and to assure uninterrupted foundry operation. Because of their rounded shape (see above) shot shields readily shed splashed metal, whereas without shields, bearings frequently are fouled and require replacement. In the rare cases where a large amount of molten metal clogs space between frame and roll, this usually can be chipped out quickly without damage to roll or shield. Damaged shields can be replaced easily and the cost is small compared to that of a bearing.

Both for pouring zones and general purposes, this company particularly recommends the Logan Dust-Protected Bearing, a bearing which is run dry, not lubricated (see illustration). Experience over the last 10 years has shown a steady trend to this bearing and away from the pressure lubricated and grease packed constructions, particularly those relying on felt washers for the sealing element. Where felt washers are used there is always the likelihood of (a) excessive friction (b) hardening and shrinking (c) wear and replacement costs . . . except where an expensive precision type bearing is used.

Unless regularly serviced, even a pressure-lubricated bearing will accumulate enough dust and grit actually to damage the bearing. And for those few cases where a lubricated construction is mandatory, Logan offers a pressure-lubricated bearing using all-steel seals, which completely overcomes the disadvantages of felt washers.

Logan recommends (and is furnishing every day) the dry bearing, illustrated above, for virtually all foundry uses. For details, write today.

Logan Conveyors

LOGAN CO., INC., 580 CABEL STREET, LOUISVILLE 6, KENTUCKY

EFFECT OF GASES ON TIN BRONZES

(*Continued from page* 71)

realm of physical chemistry, which has no place in this article. It is evident, however, that we should know the gases which are likely to cause difficulties and develop methods of eliminating them from the molten metal.

Gases may result from a number of causes. First of all, they may be present in the metal when it is charged. There is probably no commercial metal which is entirely free from gases, and for certain uses there are indications that slight amounts of the right gases are beneficial. Any metal which is smelted by electrolytic methods probably contains considerable hydrogen which will not be removed except by rather involved refining procedures. Foundry returns and scrap often contain water, oil, dirt and often paint which form gas under the influence of heat and may be absorbed in the melt, unless special precautions are taken to prevent such absorption. All metal should be dry and thoroughly cleaned of all organic matter.

Gas Absorbed by Metal

The greatest source of gases appears to be the melting atmosphere, which includes the products of combustion as well as any excess gases from the atmosphere such as water vapor. As this has always been considered to be the chief cause of gas pick-up, this discussion will be limited almost entirely to this phase of foundry operation, although recent tests have indicated that pick-up of moisture from the green sand molds, also the reaction of the hot metal with the core binders of dry sand molds may be even greater cause of porosity in the metal. Moisture in the ladle lining can be a considerable source of gas in a metal; also we must not lose sight of the possibility of absorbing gases from the atmosphere while the metal is being transferred from the furnace to the mold.

Considering the variables mentioned above, the gases which may come into contact with molten metal may be listed as follows, keeping in mind that the actual amounts may vary, depending upon the type of melting equipment used, the method of molding and the mold material:

Water vapor (from the air, furnace gases, furnace lining, ladles, and molds.)

Hydrocarbons (from oil, gas, paint, core binders, or other organic material.)

Nitrogen (from the air.)

Carbon dioxide (One of the products of combustion of fuels and from the burning of organic matter.)

Carbon monoxide (from the incomplete oxidation of organic matter such as fuels and core binders.)

Hydrogen (from decomposition of water vapor and hydrocarbons.)

Of the listed gases, it is probable that only the three elemental gases —oxygen, nitrogen and hydrogen— would have any direct effect upon the metal. Proof has been offered, in fact, that compound gases cannot dissolve in molten metals. The majority of opinions place the chief blame on hydrogen as being the really bad actor. It is true that oxygen unites easily most of the component metals of a bronze and, once formed, some of the oxides are dissolved in the molten bath. In most cases, however, these oxides can be decomposed and removed before the metal is poured. There are also indications that a very small amount of copper oxide may actually improve the properties of a tin bronze.

Nitrogen probably does not dissolve to any noticeable extent in molten bronze, but it may combine to a small extent with the zinc to form an unstable nitride. The fact that this nitride is unstable at the temperatures of molten bronze brings some doubt to bear on actual formation of such a nitride. It is probable that nitrogen does not remain dissolved in molten bronze and for this reason does not require serious consideration.

Hydrogen Dissolves Easily

Hydrogen, on the other hand, can dissolve very easily in most molten metals if it is present in the nascent or atomic state. It has been reported that hydrogen gas can be passed through a melt of bronze and no harm will result; in fact, the metal is improved insofar as soundness is concerned. This is probably true, as evidence points to the fact that molecular hydrogen, which is the condition of all ordinary hydrogen, will not be dissolved in the metal to any appreciable extent. An improvement may actually result because the molecular hydrogen will tend to flush out that dissolved gas which is in the atomic state, thus removing it from the melt.

However, there are more economical and less dangerous methods of accomplishing this. The fact has been mentioned only because the experiments described have been used to prove that hydrogen is not the gas which causes or aids in the formation of shrinkage porosity. The fallacy in these arguments has been that the hydrogen used was in the molecular state and was not absorbed by the metal.

Keeping in mind the statement that polyatomic gases (those whose molecules are composed of two or more atoms) will not dissolve in molten metal, we need have no concern as long as they remain as such. However, what happens when these compounds come into contact with the metal must be given careful consideration.

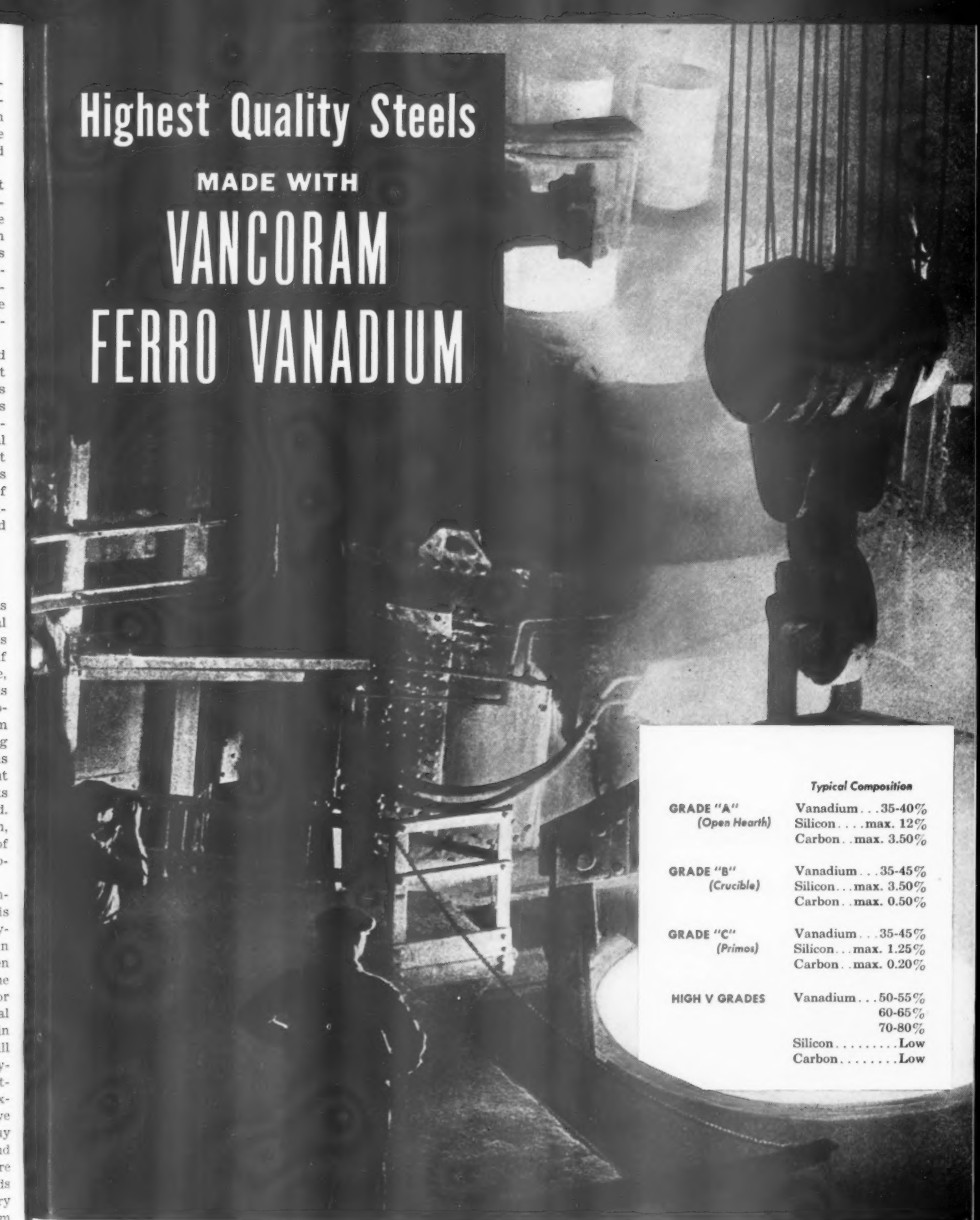
Some investigators have claimed that dissolved carbon has an effect on causing porosity. It is the author's opinion, however, that such reports of carbon solubility show carbon contents below the limit of analytical error, which leaves some doubt whether the presence of carbon was actually proved. If the presence of carbon is really harmful, then certainly some drastic action is required with regard to melting equipment.

Metal Exposed to Carbon

There are few types of nonferrous melting equipment in which the metal is not exposed to carbon, the oxides of carbon, or to hydrocarbons. Even if we could melt without such exposure, the bronze if poured into sand molds comes into contact with some carbonaceous material, usually in the form of core binders and organic bonding materials in the sand. The author is not inclined to worry too much about the possible effect of carbon until its deleterious effect is absolutely proved. Due consideration must be given, however, to the indirect effect of carbon, carbon dioxide, carbon monoxide and the hydrocarbons.

From his own experience in nonferrous foundries, the author is strongly inclined toward dissolved hydrogen being the chief offender in causing interdendritic shrinkage, even though no free hydrogen occurs in the fuel, the products of combustion, or in the atmosphere. If the material charged contains no hydrogen in amounts greater than that which will remain in solid solution, and no hydrogen is added during or after melting, then no trouble should be expected from this source. All we would have to do would be to buy gas-free metal, keep it clean and dry, melt it at as low a temperature as possible, and pour it into molds which would provide the necessary feeding. We are evidently far from such a utopian state of affairs, however. If the castings which form the scrap were rejected for leakage, there

(*Continued on page* 145)



	Typical Composition
GRADE "A" (Open Hearth)	Vanadium . . . 35-40% Silicon . . . . max. 12% Carbon . . max. 3.50%
GRADE "B" (Crucible)	Vanadium . . . 35-45% Silicon . . . max. 3.50% Carbon . . max. 0.50%
GRADE "C" (Primos)	Vanadium . . . 35-45% Silicon . . . max. 1.25% Carbon . . max. 0.20%
HIGH V GRADES	Vanadium . . . 50-55% 60-65% 70-80% Silicon . . . . . Low Carbon . . . . . Low

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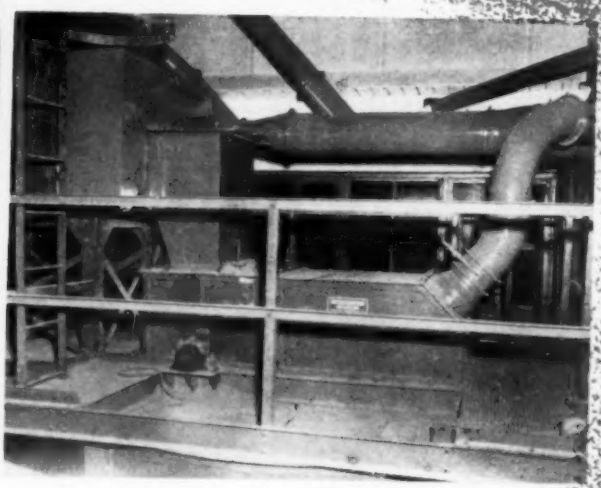

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DO IT THE NEW WAY

Left top: Molding station hoppers with undercut gates. Gravity mold conveyors in foreground.
Right top: Super-Aerator and Cooler in shoe last foundry.
Left center: Apron Conveyor under shakeout in sanitary ware foundry.
Bottom left: Lump reclamation unit in steel foundry.
Bottom right: Round sand bin with quick adjustable feed gate rotary plate feeder.

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Sand handling, cooling and conditioning equipment, mold conveying systems, reclaiming units, rapless core drawing machines.

REPRESENTATIVES IN PRINCIPAL CITIES

(*Continued from page* 142)

is danger of hydrogen being present which may not be expelled by ordinary melting procedures and consequently remain in the metal to cause further difficulty in all subsequent castings. Melting and ingotting of this scrap will not necessarily remove this hydrogen unless special refining methods are applied, such as are used by reputable ingot suppliers. Theoretically, the remelting of scrap should cause no more trouble than if all ingot were used, provided the scrap had not become gassed by previous melting.

In remelting of very badly gassed bronze, such as is indicated by large gas holes in the fracture, some of the gas may be given off as the metal melts, but a considerable part of it may dissolve in the metal to be again set free when the metal solidifies. There may be arguments that the free hydrogen which is present in the cavities in the metal is molecular hydrogen and, therefore, is incapable of being absorbed by the melt. The author has been unable to find actual proof that hydrogen, either molecular or atomic, can be absorbed by solid metal.

Should Charge Clean Metal

If it is not absorbed, molecular hydrogen existing in the scrap or ingot, or hydrogen compounds present on the surface, could cause little or no harm. A danger does exist, however, when dirty scrap or ingot is added to a pool of metal already melted. Such dirt will contain moisture or hydrocarbons which may be decomposed when in contact with the already molten metal, forming nascent hydrogen which will enter the bath. Until we can prove conclusively that hydrogen cannot be absorbed by solid metal we should take the precaution of charging only clean metal.

Another precaution often advised is to refrain from preheating ingot or scrap in the flame issuing from the top of the melting furnace. Here again, if the solid metal can dissolve hydrogen, such preheating is a dangerous practice as the flame issuing through the cover of a gas or oil fired furnace is heavily charged with water vapor. If the solid metal cannot absorb hydrogen no harm should result from this practice which is a very economical method of preheating and one almost universally practiced.

Probably the point of greatest liability to hydrogen pick-up is in the melting operation. A large proportion of bronzes are melted in oil or gas-fired furnaces where conditions are ideal for such pick-up to occur. Fuel oil and gas belong to a class of chemical compounds known as hydrocarbons; that is, they are made up completely of chemically combined hydrogen and carbon. When hydrocarbons burn completely in air, the oxygen of the air combines with the two constituent elements and produces water vapor (steam) and carbon dioxide. The nitrogen of the air does not enter into the reaction, but passes through the furnace unchanged.

Therefore, if the correct proportion of fuel and air are used to produce complete combustion, thus attaining the maximum temperature, the products of such combustion will be water vapor, carbon dioxide, and

nitrogen, which should pass out of the furnace along with most of the heat produced by the combustion. If an excess of air is used, the exhaust gases will also contain all the excess oxygen over that actually necessary for the combustion. If the fuel is in excess, however, it will be incompletely burned and we will have carbon monoxide and perhaps free carbon in the form of soot in the exhaust gases.

For maximum heat we should have what is known as a neutral flame—one in which the air and the fuel are proportioned in such a manner as to supply just the amount of oxygen which is necessary to burn the fuel completely to carbon dioxide and water vapor. As this condition is almost impossible to control and maintain, it is usually recommended that a small excess of air be used, giving a flame which is slightly on the oxidizing side. This has been considered to give better castings than would be the case if we used an excess of fuel, with the flame on the reducing side. The following discussion will attempt to show why an oxidizing flame is to be preferred over even a neutral flame and at the expense of some heat.

To give a complete discussion of combustion of fuels would require rather extensive use of physical chemistry principles. It is believed, however, that the following explanation will be rather easily understandable, though a few such principles are necessary even for a simple explanation.

Using propane, which is a typical gaseous fuel, and one used by numerous foundries, as an illustration, this gas burns in oxygen according to the chemical equation:

(1) $C_3H_8 + 5\ O_2 = 3\ CO_2 + 4\ H_2O$

propane, oxygen, carbon dioxide, water

The whole numbers immediately preceding the formula of each compound indicates the comparative volumes of the reacting substances provided these compounds are in the gaseous state, as is true in ordinary combustion using gaseous fuel. The above equation indicates, therefore, that for each cubic foot of propane used, 5 cubic feet of oxygen will be required for complete combustion. Expressed in terms of air, approximately 25 cubic feet of air would be required to supply sufficient oxygen, the excess 20 cubic feet being nitrogen which does not enter into the reaction and is not shown in the equation. However, for each cubic foot of propane used, there will be formed 3 cubic feet of carbon dioxide and 4 cubic feet of water vapor or steam.

A more startling example is that shown when fuel oil is used. Although no fuel oil is a single pure hydrocarbon, but rather a mixture of hydrocarbons each having its own particular chemical formula, the mixture of oils composing a normal foundry fuel oil will have approximately the average chemical formula $C_{15}H_{32}$. Complete burning of such an oil can be expressed by the equation:

(2) $C_{15}H_{32} + 23\ O_2 = 15CO_2 + 16\ H_2O$

which means that for every gallon of fuel oil burned, almost 11 pounds of water vapor are formed and which may come into direct contact with the surface of the melt.

If the water vapor remained as such, little or no difficulty would be experienced, as it is doubtful if water as such can be absorbed by the metal. It will, however, tend to break down or decompose according to the equation:

(3) $H_2O \rightleftarrows 2\,H + O$,

the double arrow meaning that the reaction can go in either direction. Water vapor will break up to form hydrogen and oxygen, but at the same time the hydrogen and oxygen

will reunite to form water vapor. We thus have a condition of equilibrium where the amount of decomposition exactly balances the association. At any certain temperature we will have a mixture of water vapor, hydrogen and oxygen, the relative proportions being dependent upon the temperature. As the temperature rises, we will have more hydrogen and oxygen and less water vapor, or as the physical chemists state it, the reaction will be displaced toward the right with increase in temperature.

Oxygen is Active

There is another peculiar thing about the reaction expressed by equation (3). If we remove either hydrogen or oxygen from the mixture of gases, a rearrangement will occur whereby more water vapor will dissociate and more hydrogen and oxygen will form in order to keep the reaction in equilibrium. Carrying this reasoning further, as both the hydrogen and the oxygen are monatomic, or in the nascent state, when the dissociation first occurs, the oxygen is very active as regards its ability to unite with the constituents of the melt and form oxides. At the same time, the nascent hydrogen will dissolve very easily in the molten metal. Both elements, being removed from the atmosphere above the melt, more water vapor will dissociate, giving rise to more nascent hydrogen and oxygen which will, in turn, be dissolved.

Having explained how hydrogen can build up in a bath of metal, it is fortunate that we have a method of preventing this to a certain extent, working on the basis that it is easier to prevent hydrogen pick-up than it is to get it out of the metal once it has become dissolved. Referring again to equation (3), if we increase the amounts of either component on the right side of the equation, reaction will be displaced toward the left. In other words, if we add either hydrogen or oxygen, we will obtain a greater proportion of water vapor at the expense of the monatomic gas which was not added.

(To be concluded next month)

References

1. "Solidification Mechanism of Tin Bronzes" by Clyde L. Frear, THE FOUNDRY, April, 1948, p. 68, and May, 1948, p. 130.

Note: The opinions expressed here are those of the author and do not necessarily reflect those of the government or the Navy.

A new group of the Gray Iron Founders' Society has been formed in North Carolina and will hold regular meetings in Charlotte. Nelson L. Smith, president, Eureka Iron Works, Lincolnton, N. C., is chairman of the group.

RATING BETTER PEOPLE IN OUR FOUNDRIES

(Continued from page 79)

tant, I would want to hear the company's plans for the future—the long future, not merely the next few months. If the thinking were sound and comprehensive, each part of its planning would be an additional reason why that company could expect to rate better and better people each year. This outlook would be the basis for my believing that I would be working with right people who would have a "right" place for me to enlist for my life work.

Getting right people is not one of those things that requires merely the decision, like buying a drink. It takes long-range planning and requires time in its accomplishment. It takes patience and persistence.

The progress of companies can be accelerated by definite written plans covering each phase of operations. Any detailed plan should have dates set as to when you plan to start this and when finish that. We all know plans must be elastic, subject to all sort of changes. The plan must not control. That is management's job. But long-range planning, in outline at least, is essential to long-range success.

We all need not only to spend more time on our planning, but more guts in sticking to our plans. It takes courage to see that emergencies, cowardice, laziness, public opinion, the need of socking current earnings, do not break down our courage and our consistency in deciding our problems in terms of the long future. It takes detailed plans which can be referred to from time to time to be sure you are not overlooking some important part of the plan. In no department can the planned progress be taken for granted. You will find continual improvement in the plans easy, but they should not be altered with every shift in the business breeze. Remember, we are talking about plans for long years ahead, some of them plans which only a successor can fulfill.

In any plan, right people come first. If you are sincere as to this, the first step will be eliminating the wrong people.

At a recent foremen's meeting I suggested that each man make a list of the men under him whom he disliked, and when he got back home, to take a new look at these men. I asked superintendents to do the same thing as to their foremen. If there are to be good human relations, we must watch out to see that prejudices are not warping our judgment. Of course, if the final judgment is unfavorable, the man must be moved.

Then comes the problem of attracting the right people, and to get the full benefit of right people you must concentrate on their development. This of itself is no part-time task and must have first call on both your time and your ability.

For management jobs of the future, we must carefully plan training people in our own ranks. Their source should be our apprentice courses. In deciding the number of young men to be taken on, we should have a spare or two for each department, knowing there will be some casualties as time runs on.

Discouraged Apprentices Drop Out

The usual apprentice training program is the result of the experience in many companies, and of careful comparative study. As we all know, the best plan ever drawn is not of itself enough to accomplish high success. Careful selection of the men is more important than the plan. Making the journey through the course interesting and enjoyable for them is necessary. Seeing that the timing of the periods in different departments is adjusted to the individual needs is a fundamental part of any successful plan. Some men need more of one type of training and less of another type than the standard periods. Proper pay adjustments in relation to other job pay-changes reduce the number of the discouraged. And it is the discouraged who drop out.

It is good to have these boys see something of senior officers, and be given the opportunity to ask questions. In other words, the men in an apprentice course must be handled as individuals. The carry-on should be more like a tutoring school, where the student receives individual consideration, than like a college class which is pushed through as a group.

One measurement of effectiveness will be what portion of the best men stick out the course, and stay on afterwards. Another yardstick of your effectiveness will be the number of young men applying as a result of hearing your company spoken well of by their friends. This of itself can create the flow to you of the men you need.

The handling of apprentices is one of the best yardsticks for a young man to use in sizing up the place he is considering spending his work life.

(Continued on page 148)

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Kodak Liquid X-ray Developer and Replenisher. Offers greater preparation convenience. There is economy, too, in the unit package.

(*Continued from page* 146)

I no longer think merely in terms of whether a youngster rates our taking him on. As we sit across our desk from him, I believe we should figure how best we can rate his favorable consideration of joining our ranks. He will quickly sense that we are looking at his side of the bargain as well as our own.

One of the major problems today is to see that superintendents and plant foremen are the best possible men for their responsibilities. Their ability to work with people, and also to represent the company interests fairly, is of paramount importance. To most of our people, they are the company. Our rating in the community rests largely on their day-to-day relations with our people. Sound planning recognizes the best possible type of foreman as essential to success of any program.

With this in mind we are holding a series of foremen's meetings. We have labeled these meetings "Information Centers." We are trying to have all men in supervision better understand the company and we believe, long range, that this will help employee understanding and thereby improve our human relations.

If people must be Item One in any tabulation of plans, in the foundry business plants come next.

Plan Far in Advance

Too many plant changes are based on sudden decisions — emergency measures. Too little attention is paid to fitting them into the other changes which will come later on. We, in Brake Shoe, have tried to meet this by having each plant begin on next year's capital expenditure budget during the *second* quarter of the current year and, also, by classifying the recommendations under headings of "necessary," "advisable," and optional."

Each foreman has the responsibility of originating the recommendations for his area of operation. This set-up has made the planning better. Changes which improve working conditions are all classified as "necessary." How else can we improve our ability to deserve better people, especially in foundries? The number of changes involving only minor expense, but which prove important to the worker, is always surprising. Among the major changes, which usually prove expensive, are ventilating and lighting.

Many changes which prove really important result from someone's ability to take a new look around a particular foundry. Some come from people who never even worked in a foundry—just walk around wondering why this and why that. Often we are surprised and shocked to have overlooked so long the things that attract their instant attention.

Providing good wash and locker rooms and a decent place to eat has been most costly, but I believe it has paid dividends through the appreciation by a large number of our workmen. Now, practically all men take showers. But I am continually surprised how many still prefer a sand pile to the lunch room for their meal. These are disappointments.

One top essential in company planning has to do with safety policies and methods, and especially with silicosis, lead poisoning, and such health hazards. If planning is sound, there are times when safety measures must take priority over a needed new tool, if money is not available for both. Only such a basic policy rates top foundry people.

Provide Welfare Aids

Certainly no company, indifferent to the protection of its people, rates right ones. Where size makes the expense practical, a plant safety man and a plant nurse are "musts." Otherwise, there can be a part-time set-up with neighbors, or an arrangement with a nearby hospital or a visiting nurse organization. As the foreman is the reflection of the company, to the men under him, so the industrial nurse has an opportunity to reflect the human side of our companies to the families of our people. She has daily opportunity to contribute toward the family's safety and peace of mind. She has endless opportunities to make life seem more secure to company people. She can be tangible evidence of our recognition of the obligation we feel to help our people. We expect her to be their friend in times of trouble.

But it is amazing how little a right safety and hygiene set-up accomplishes, unless there is genuine enthusiasm on the part of each man in supervision and, most important of all, on the part of the president. The removal of a foreman or other supervisor, because he lacks sincere enthusiasm, speeds up effectiveness. And if you are sincere, men with supervisory responsibility must be "sold" on the cause or fired.

We who have spent many years in the foundry business know we have a bad record to live down. Also, we know that further improvement in working conditions must be made if we are to compete successfully with other industries for the best people in our communities. Certainly there must be more mechanization, less lifting, fewer tired backs at night. We have made progress, but there is still a long road to be traveled.

At last, our industry is striving

(*Continued on page* 150)

Reader's Comment

TO THE EDITORS:

You may recall that several years ago I discussed with you the advisability of making railroad buck plate castings of gray iron. The major force to which they are subjected is compression. Under ordinary conditions these do not break. In a derailment or wreck, of course, everything is torn up, frogs, switches, rails and cars. The accompanying illustration shows 6½-lb gray iron buck plates in an application where the road was suffering from loose switch plates and damage to the expensive ties. We claim this damage

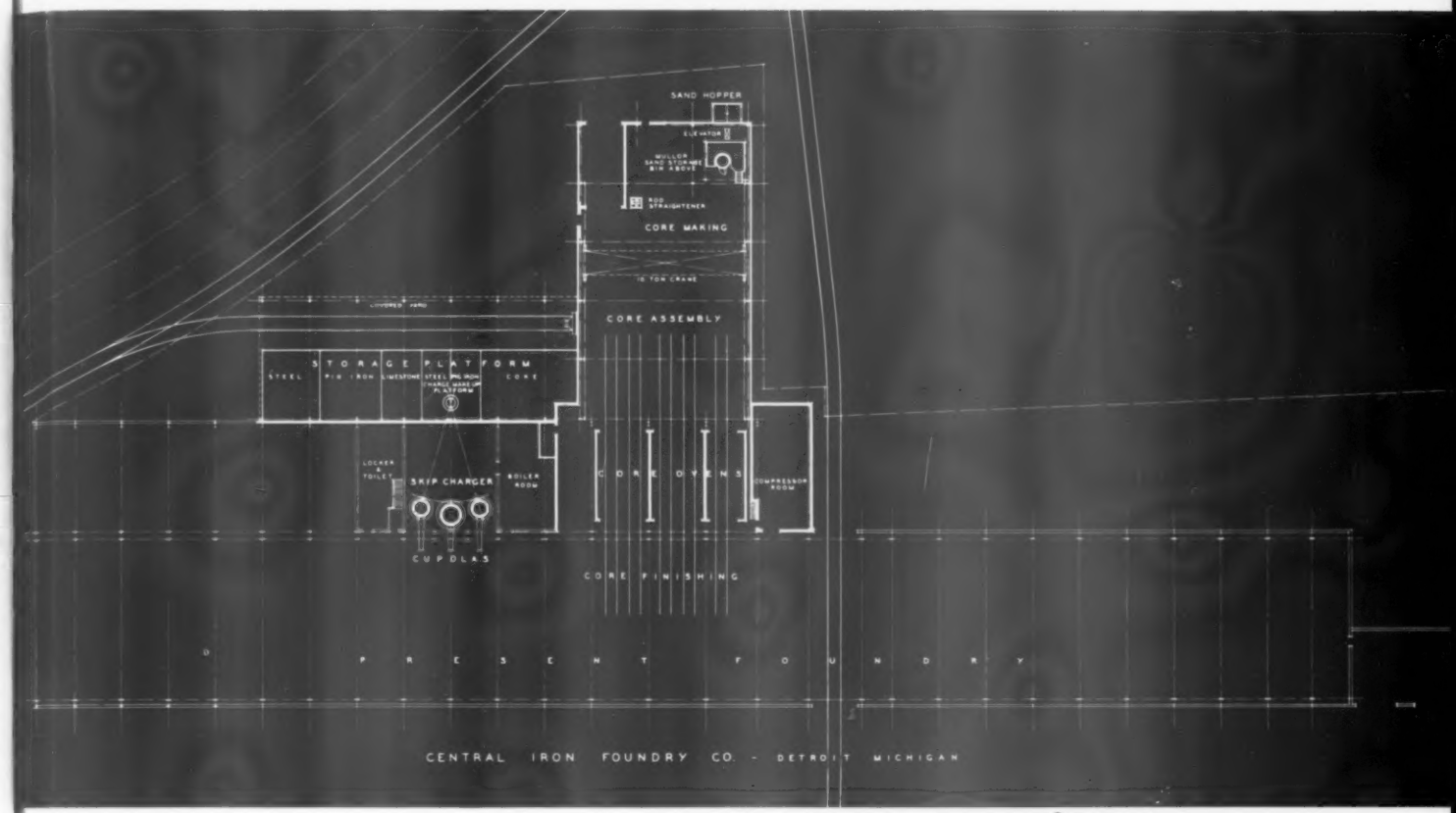
Cast iron buck plates held in place with screw spikes

arises from unthwarted lateral force developed in railroad tracks under trains.

My son and co-worker developed a matchplate pattern for use without dry sand cores. The upper portion, or that part next to the track, is a half cylinder to engage the screw shank and head. The half portion opposite is a half core. The pattern is drawn easily from a green sand mold. I have been in and an observer in track maintenance for many years and I don't think we ever have made sufficient use of the foundry where hot metal can be poured into a sand mold to produce any desired shape, instead of cutting off a piece of bar iron or steel and hammering it to shape. Makers of automotive, agricultural and stove products cast the parts in the foundry. We greatly appreciate the pointers received from THE FOUNDRY.

H. L. RUSHING

The H. L. Rushing Co.
Larkin Springs Road
Madison, Tenn.



To increase production and efficiency, this important automobile body die foundry has retained Giffels & Vallet, Inc. to develop a new core room which will provide for greater production and better material handling in their foundry.

In cooperation with the owners, the engineers prepared layouts, estimates and designs, and will supervise the construction . . . . so that the investment will provide a most efficient facility.

GIFFELS & VALLET, INC.

INDUSTRIAL ENGINEERING DIVISION
1000 MARQUETTE BUILDING, DETROIT

(*Continued from page* 148)

intelligently to improve its products. In the old days our main interest was in lower costs and higher sales prices. Looking way back, it seems to me our efforts had to do mostly with the current year's earnings. The future of the industry and the quality of product were discussed, but few dollars were "wasted" on what were then thought of by many of us as the intangibles. In those days only the great optimists were without worry as to the future of the iron foundry industry; but even our optimists were not putting additional cash into our stock, pre-World War I. We discussed plans, but spent practically no money on such intangibles as metallurgical research. Actually most of the men in our industry had little faith in its future in those days.

Looking back, it seems to me that very often the big news had to do with losing business to cast steel, to forgings, to aluminum, to zinc. Iron foundry products did have a poor reputation and, generally, rated no better. Mostly, they were bought because they were cheap. From today's standpoint, there was little control of their properties, and most castings were unsound. To me, looking back, that was the "Dark Age" of our industry. Not only were the working conditions bad, but the product did not rate right people. Actually, less and less good ones came to our plants in the hope of getting jobs.

The engineering schools felt that way about us and guided their graduates into other fields. But worse, foundries generally did not often want engineering graduates. We felt the man had to start as a molder or coremaker, or an exceptional patternmaker to qualify as a superintendent. As to salesmen, we thought mostly in terms of personality.

In the early twenties, the companies headed by the better planners began not only to plan but to act—spend money on the intangibles. In that period, which ran through a large part of the 1920s, most of us worried enough, but did little on the constructive side. It took the depression of the 1930s with its red ink to put us in motion on a large scale. Then we not only worried—we planned action, and acted. Sound plans began to build today's better outlook for us. At last that outlook has begun to rate the best young men joining our foundries.

There has been a renaissance in our industry. Colleges, foundations, scholarships, special foundry equipment in laboratories, are at work training men for our industry, and advancing our knowledge of the possibles. In the old days, the large foundry companies were the only ones who could afford research organizations, but mostly even they did little about it. Today, as far as I know, all companies are spending real money on research. Research organizations are at our command in universities, and industrial laboratories, like Battelle and Armour institutes, are available to all of us.

We were a backward industry. Today, by combining with others through trade and technical organizations, the smallest units can be in the front as to research. This part of the advantage large companies once had exists no more. Smaller companies which have the will to progress, and can function in team play, have equal opportunity. Progress is automatically broadcasting itself to college boys, and bringing more and better engineer graduates to take a look at the opportunity our industry has to offer.

Recognize Metallurgists' Value

In the old days most payrolls showed sales people in the top group; next, but much lower, operating people; and way, way below, engineers—if the company did happen to have such. Today we know our future depends on sound castings made of the analyses which best meet customer service. We can afford to pay metallurgists on a basis which makes the money opportunities in research commensurate with those in sales and operating.

But to deserve—and get—outstanding youngsters in engineering and research, an adequate pay rate is not the only requisite. There must also be proper equipment and, just as important, the prospect of security of employment. We must live down the record of dropping engineers from the payroll first when sales volume starts to skid. They need proof, if we are to get the good ones, that research and development will go on during future periods of depression. In the company dominated by long-range planning, it *must* go on as long as there is cash in the till.

There are four vital needs which will be met by success in rating and getting top quality in research and engineering youngsters.

The first need is in our research department and in plant metallurgical departments.

The second need is a flow of "right" personnel from the research department to operating positions. Brake Shoe has six foundry divisions. The operating heads of three came from research personnel. A fair sprinkling of plant managers and assistant managers have also come from there. In the last three years metallurgists have been transferred from research to operating divisions. Here is proof of

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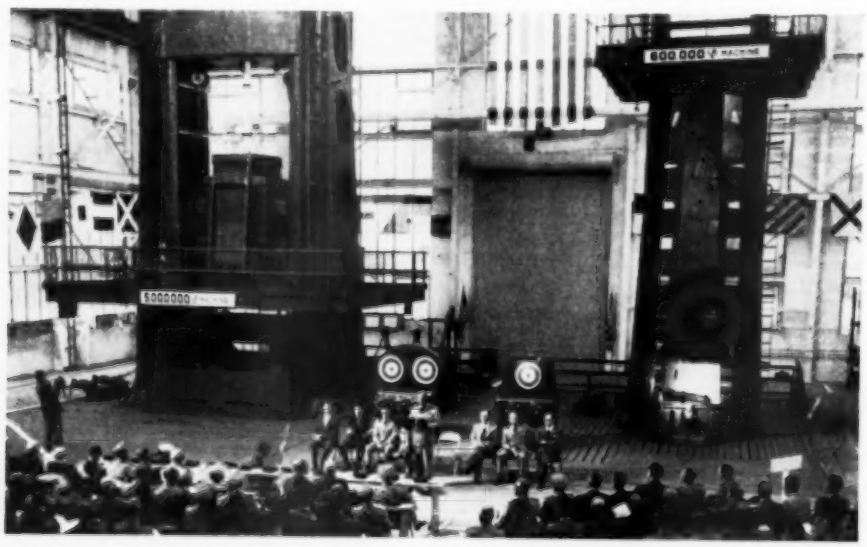


TESTING MACHINE: The U.S. Naval Air Experimental Station, a subordinate unit of the Naval Air Material Center, recently demonstrated the world's largest universal testing machine at the Aeronautical Structures Laboratory, Philadelphia Naval Base. The machine has a 5,000,000 lb capacity and was built to Navy specifications by the Baldwin Locomotive Works, Philadelphia. The new machine accommodates specimens up to 30 ft high, 10 ft wide between columns and 50 ft long, and can subject them to high stresses in tension, compression or flexure. It will be used for testing the lightest weight aluminum and magnesium structures that aeronautical engineers can design to meet the severe requirements of modern flight (U. S. Navy official photograph)

PALMER-BEE POINTS THE WAY TO

SAVINGS IN MATERIALS HANDLING

• Illustrated above is the Palmer-Bee "Kant-Leak" Apron conveyor loaded with sand and castings after the line is dumped.

This type of conveyor can be used for handling almost any kind of loose material where leakage is undesirable; it is especially efficient for handling fine dry abrasive materials such as foundry sand from Shakeout, dry core sand, and feeding sand from storage bins. It can also be used for handling castings, iron and steel chips and turnings.

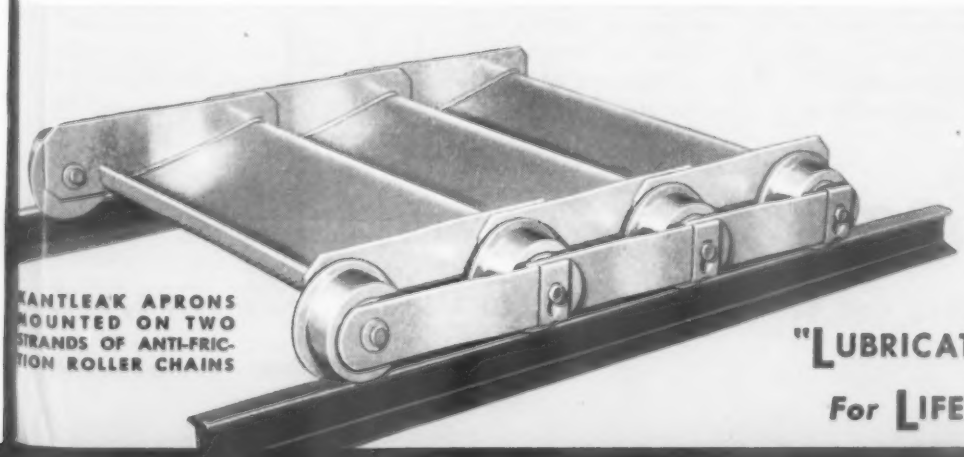
This design features the only non-leak type of overlapping apron conveyor where high side links of chain can become the side of aprons. This construcion permits the supporting rollers to be contained in the chain every pitch, and also used for the return run. No overhung rollers are required.

An important feature of the conveyor is the discharge. The overlapping flanges open up and a CLEAR SLIDE UNOBSTRUCTED BY A DOUBLE BEAD IS PRESENTED FOR THE POSITIVE DISCHARGE OF MATERIALS. Mold size varies from 12″ x 18″ x 8″ to 15″ x 30″ x 12″ and 24″ x 24″. The conveyor is 30″ wide—travels 30 F.P.M. 25 tons of sand per hour and 4 to 5 tons of castings per hour.

PALMER-BEE COMPANY

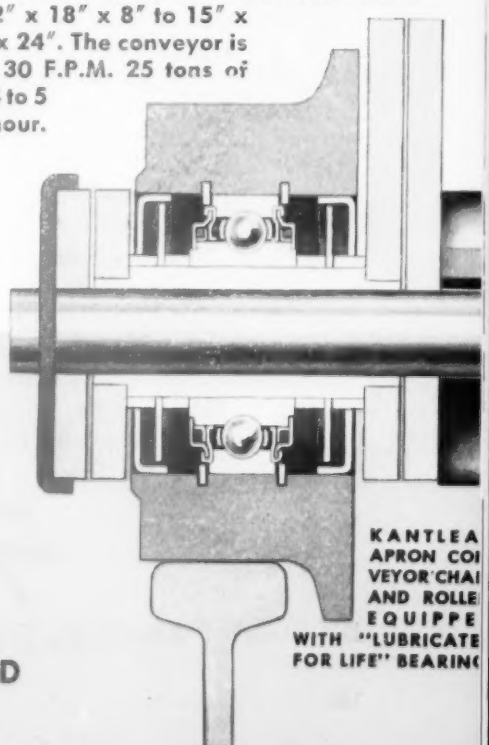
WESTMINSTER AT GRAND TRUNK RAILROAD • DETROIT 12, MICHIGAN

BRANCHES: CHICAGO • PITTSBURGH • MILWAUKEE • WINSTON-SALEM • NEW YORK CITY

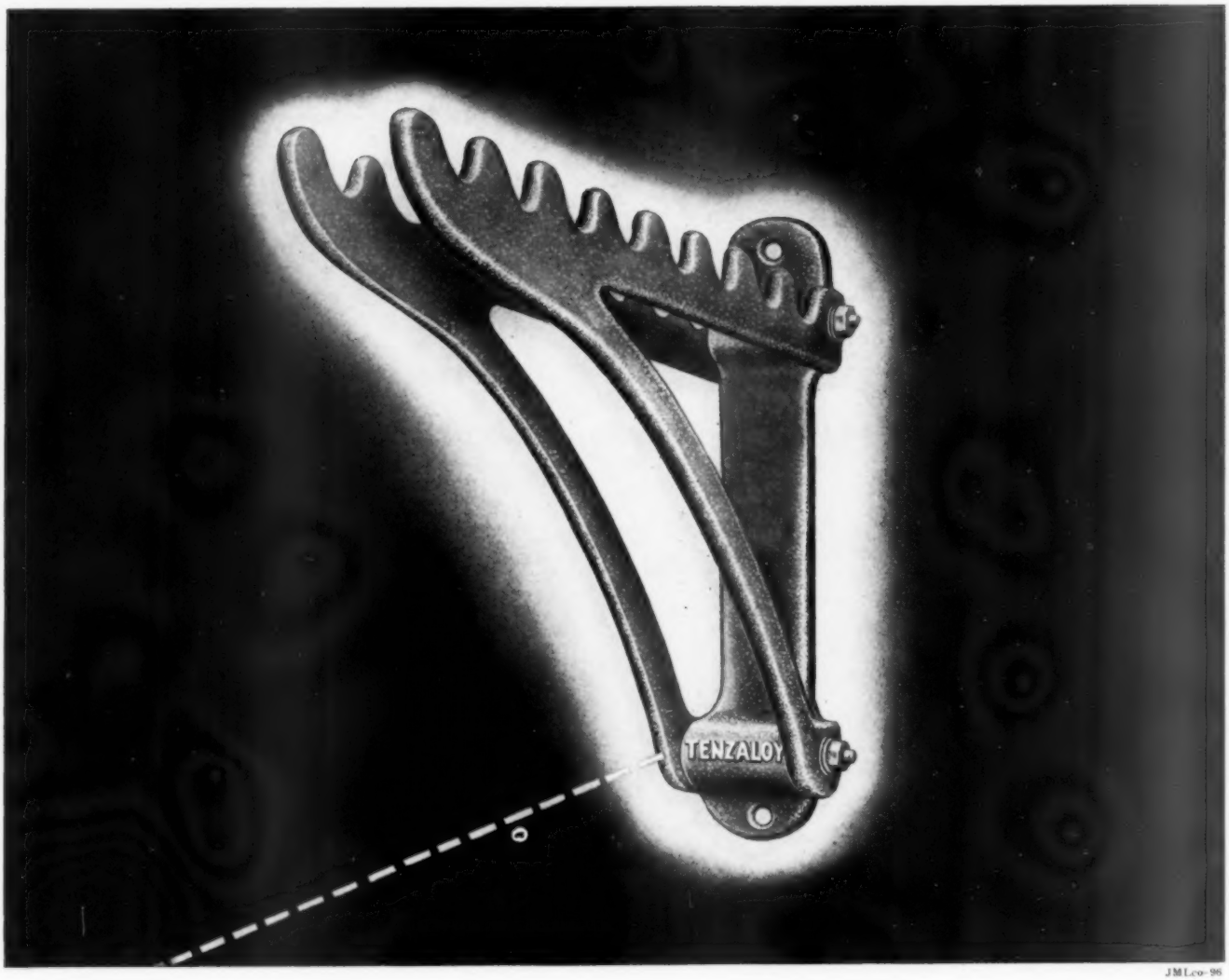


KANTLEAK APRONS MOUNTED ON TWO STRANDS OF ANTI-FRICTION ROLLER CHAINS

"LUBRICATED For LIFE"



KANTLEA APRON CO VEYOR CHA AND ROLLE EQUIPPE WITH "LUBRICATE FOR LIFE" BEARIN



JM Leo-98

For High Strength without Heat Treatment!

This aluminum casting is a tool rack for shovels, hoes, rakes and other heavy garden equipment. The Max Manufacturing Company of San Jose, California, chose Tenzaloy, Federated's new aluminum casting alloy, for the fabrication of the product "because of its great strength as cast, without the necessity of heat treatment." Tenzaloy tensile strengths average 29,000 psi as cast, and 35,000 psi with 10-14 days aging at room temperature.

This manufacturer also states that Tenzaloy is his choice because "standard foundry procedures can be followed in its use, and the end product is a nice clean casting with a minimum of fuss, bother and expense."

Tenzaloy also has excellent ductility, impact resistance, castability, machinability, corrosion resistance and superior polishing characteristics. Send now to Federated's Dept. SJ for literature that describes Tenzaloy more fully.

Federated produces many other non-ferrous metals and alloys, including brass, bronze, aluminum and magnesium ingot; solders; type metals; die casting metals and fabricated lead products. Sales offices in 25 cities across the nation.

Federated first in the non-ferrous field SMD

Federated METALS

Division of American Smelting and Refining Company, 120 Broadway, New York 5, N.Y.

(*Concluded from page* 150)

progress in this important byproduct of research. You who have not large groups can just as easily get the operating men you need from the research men in university departments and industrial laboratories.

Thirdly, as time runs on and our future planning becomes more realistic, it is clear that all of us need positive product improvements, and new products, each of which will take us into new sales markets. These men, if the right men, will make the necessary developments in time. We need, for long-range security, new levels of quality.

Fourthly, if we foundrymen are to make progress in knowledge of customer needs, and in finding analyses to meet them, there must be metallurgical study of their needs, and continually improved process control to meet such needs. This means supervisors, or men to help them in our foundries, who understand the solutions. There *must* be process controls. Supervision must be in technical hands, or have technical men on call when needed.

Create Personnel Pool

As time runs on, I believe more and more there will be a consolidation of such activities through a pool of qualified personnel within groups of small companies. There is nothing the bigger companies have which is not available to all if there is a consolidation of efforts by groups of smaller companies. Also, automatically this will create a pool of youngsters available to each company for supplementing their management ranks.

In conclusion, I would like to summarize by saying that the curve of the long-range outlook of our industry has changed from years of a steeply descending line to a reversed trend. We are on the way up. That direction of our curve can and will continue upward if we concentrate on bringing better and better people into our ranks. The foundry industry won't rate—and will not get—right people unless our planning is long range, and unless we are willing to spend real money on the intangible of research.

The realizations, which will come from today's planning in many cases, may be far ahead. Still there can be satisfaction in the feeling that we are contributing toward the success of the tomorrow of our industry. It is realistic to think of ourselves as merely a link in the chain of progress. There is the challenge to make our link in that chain as strong as possible for the benefit of those who follow.

DEEP-SEA DIVING SPHERE

Is Alloy Steel Casting

By VINCENT DELPORT
European Manager
THE FOUNDRY

CAST chromium - molybdenum-nickel steel is the metal used in construction of the bathyscaphe in which Professor Piccard of Belgium hopes to explore the oceans at depths never before reached by man. The special alloy steel chosen is trade-named "Indefatigable" and is covered by a patent held by the Acieries de Gennevilliers, near Paris, France.

Designed by Professor Piccard, the bathyscaphe is composed essentially of a spherical chamber with inside diameter of 2 m (6 ft., 6.56 in.), mounted to a frame by four bars attached to a ring, all of which are made of the special steel alloy. Aluminum floats also are attached to the frame.

The spherical chamber was constructed under the supervision of Mr. Duby by Ateliers Henricot, at Court St. Etienne, Belgium, which used the special alloy under license from Acieries de Gennevilliers. It consists of two hemispheres cast in synthetic sand molds, and, although the molds were quite simple, they had to be made with the utmost care to minimize the possibility of casting defects.

The castings were made without cores, casements for the portholes being drilled and machined. Thickness of the metal for each casting varied from 90 mm (3.54 in.) at the joint to 150 mm (5.85 in.) at the portholes, which are located at the extremities of the vertical diameter.

Each of the finished hemispheres weighed 5 metric tons, and 12 tons of metal were used for each casting; in each case 5 tons of metal were discarded as runners, risers, etc. The metal was melted in an arc furnace, and casting of the hemispheres was done centrifugally through a bottom gate. Composition of the steel was approximately as follows: 3.0 to 3.5 per cent nickel, 0.2 to 0.3 per cent molybdenum and 1.0 to 1.5 per cent chromium with 0.3 to 0.4 per cent carbon.

Heat treatments had to be conducted with great care to meet required physical specifications. Then tensile strength was 100 kg per sq mm (63 tons per sq in.).

Machining of the sphere was done on a horizontal lathe. It will be noted in Fig. 1 that the section of each hemisphere varies from the joint to the porthole, and the diameter of the hemisphere varies to allow for the required range of thickness. A flat surface is provided at the emplacement of the portholes. Measuring and machining had to be done very precisely to avoid internal stresses which would have been dangerous at the great pressures that will be experienced.

From 15 to 20 mm (0.59 to 0.78 in.) had to be machined over the whole surface of the completed sphere, which was rectified and polished all over the surface, inside and outside and at the joint, to an accuracy of 1/100th of a millimeter.

After machining, the whole sphere was examined by x-ray. The two hemispheres were placed into position and the surface was covered with sensitized paper with reference marks corresponding to the same marks on the sphere. Following a few preliminary testings, one gram of radium was placed at the center of the sphere; after 24 hours of exposure, the sensitized paper was developed. The result showed no trace of defects, either from porosity, lack

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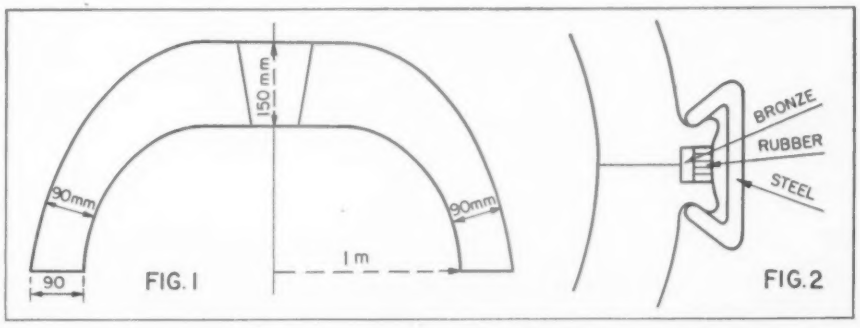
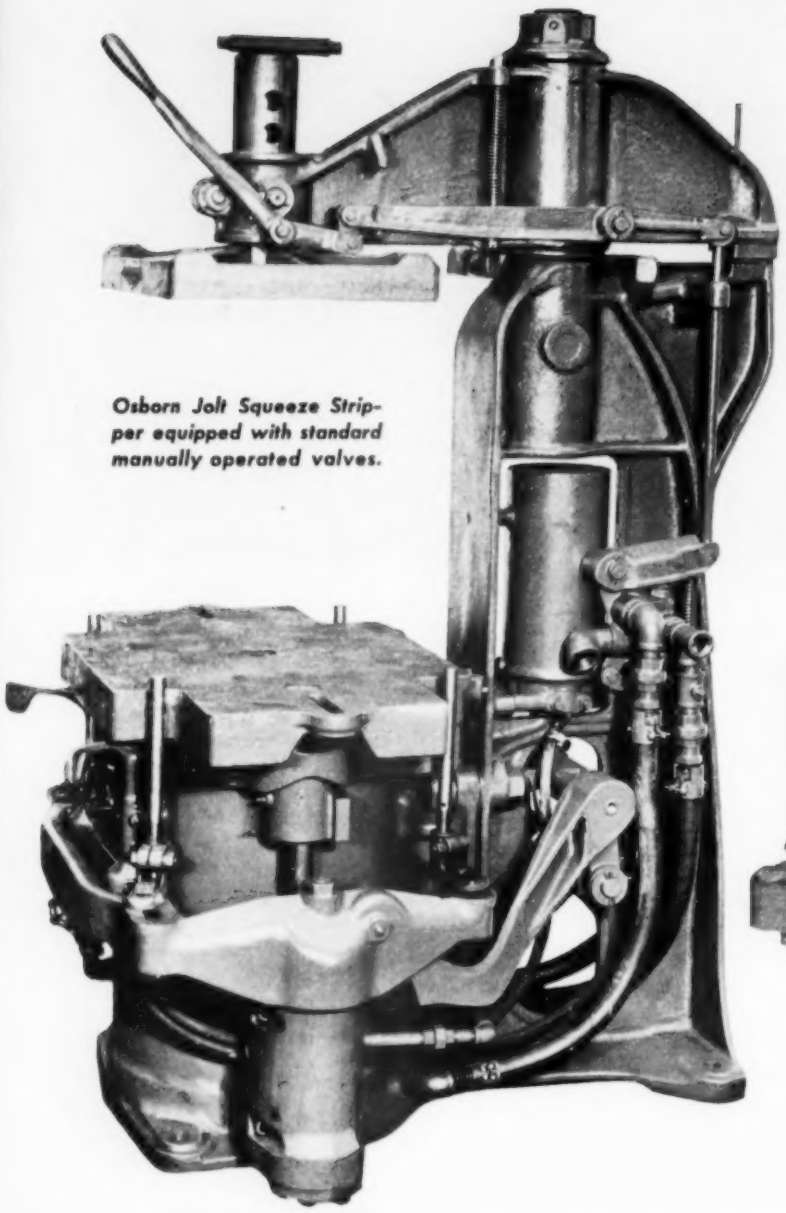


Cross-sectional views of Professor Piccard's bathyscaphe. Method of joining the two halves is shown in Fig. 2

HERE'S WHY OSBORN JOLT SQ

RATE *First*



Osborn Jolt Squeeze Stripper equipped with standard manually operated valves.

Osborn Jolt Squeeze Stripper showing air cylinder operated by squeeze head.

THE OSBORN MANUFACTURING COMPANY

5401 Hamilton Avenue Cleveland, Ohio

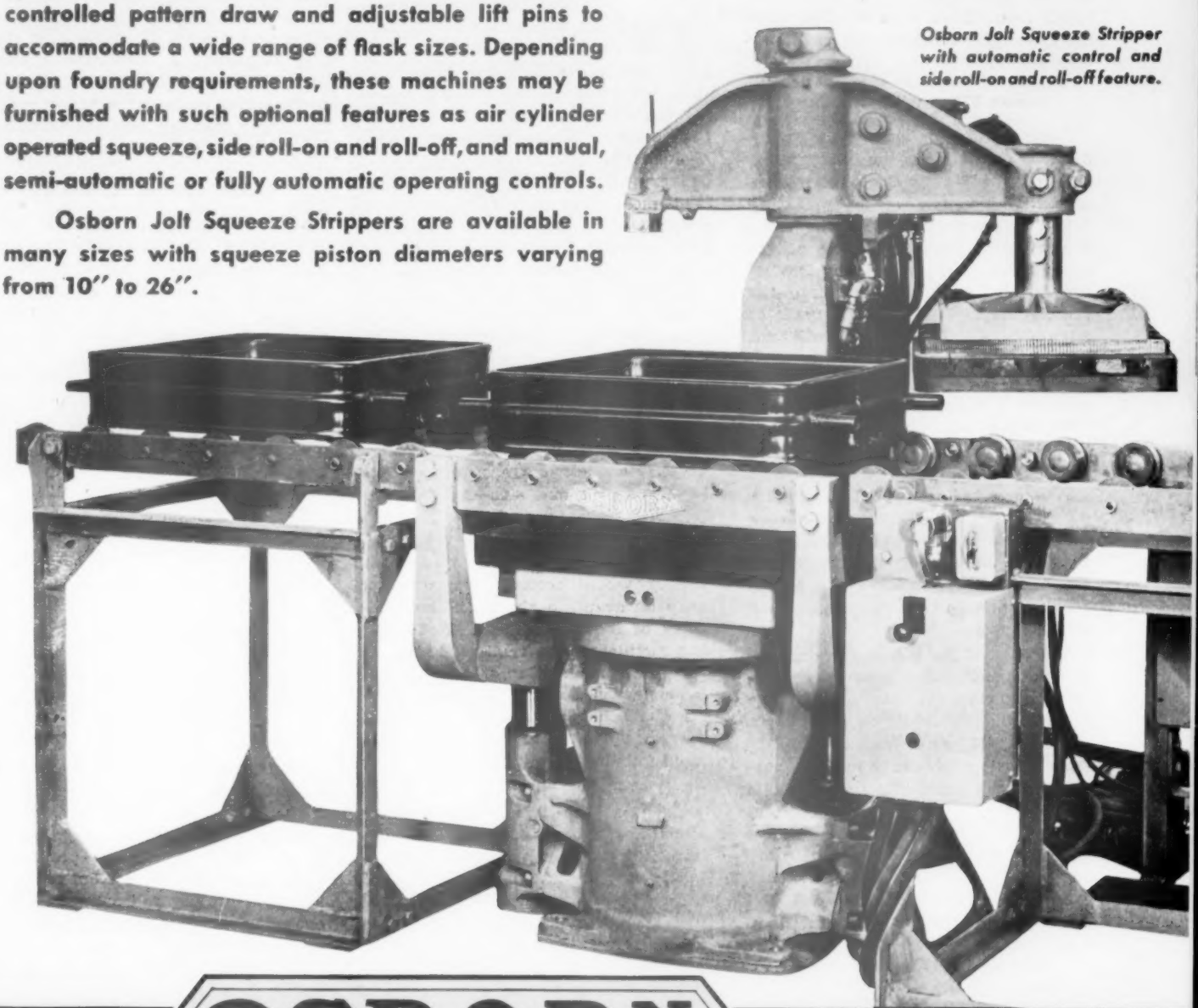
LTSQUEEZE STRIPPERS

t with Foundrymen

OSBORN Jolt Squeeze Strippers are of rugged construction and have a hard effective jolt, oil controlled pattern draw and adjustable lift pins to accommodate a wide range of flask sizes. Depending upon foundry requirements, these machines may be furnished with such optional features as air cylinder operated squeeze, side roll-on and roll-off, and manual, semi-automatic or fully automatic operating controls.

Osborn Jolt Squeeze Strippers are available in many sizes with squeeze piston diameters varying from 10″ to 26″.

Osborn Jolt Squeeze Stripper with automatic control and side roll-on and roll-off feature.



OSBORN

MOULDING MACHINES CORE BLOWING MACHINES

MEMBER MANUFACTURER'S ASSOCIATION, INC. FOUNDRY EQUIPMENT

(*Concluded from page* 153)

of homogeneity, cracks, or other sources.

The two hemispheres were joined at an initial pressure of 30 metric tons by a ring made of the special steel alloy. This pressure of 30 tons was considered sufficient to allow the sphere to reach a depth of a few hundred meters; below this depth the pressure of the water was considered sufficient to maintain the two hemispheres against each other. At the outside edge of the joint is a bronze ring covered by a rubber ring to insure water tightness.

Plexiglass was used for the windows of the conical portholes, as this was found to be the most suitable material for flexibility and resistance to high pressures. Templates were taken from these windows and were used for the finishing of the casements.

Floats Filled with Gasoline

Purpose of the aluminum alloy floats is to maintain the bathyscaphe at a correct depth and to permit its ascent. They were made by Societe l'Hoir, of Liege, which is the same firm which built the nacelle of the stratospheric balloon used by Professor Piccard in his ascents into the stratosphere. The floats are made of aluminum sheets as they will not have to sustain very high pressures. They will be filled with 27 tons of gasoline, chosen because of its lightness, compressibility and cheapness. A device is used to equalize pressures inside and outside the floats.

A large battery set will provide current for operating two electric motors which drive two propellors to facilitate movement of the bathyscaphe. Total weight of the bathyscaphe with its equipment is about 40 metric tons.

The aim of the submarine exploration is to get down as deep as possible into the sea and observe and report on what may be seen there. In the past, deep-sea explorations have been made in specially constructed chambers attached to cables having their points of attachment above the water, and the present descent record was made by Professor Beebe, of the United States, who reached a depth of 906 m (2972 ft). Professor Piccard hopes to attain a depth of 4000 m (13,120 ft) in the bathyscaphe, which has no attachment or link with the surface of the sea.

Plans for the exploration were completed in 1939, and some preliminary tests made at the time proved satisfactory, but the war interrupted the preparations and it was not until 1945 that steps were resumed to bring the scheme to execution. The venture is being financed by the Fonds National de la Recherche Scientifique, an official Belgian organization set up to encourage scientific research.

CONVEYOR SYSTEM FEATURES MODERN ALUMINUM FOUNDRY

(*Continued on page* 78)

and benches are placed on driers and loaded on racks for transfer by lift truck to the six rack type, electrically heated ovens (Fig. 9) for baking. After the cores are removed from the oven and, if necessary, are assembled, they are inspected and placed on conveyor cars. The cars then are wheeled to the conveyor where they are picked up by an electric elevator hoist (Fig. 13) and hooked into the conveyor system for delivery to either the sand or permanent mold foundry. There they are shunted off on a "siding" and the cars lowered to the floor.

Mold conveyor trains move on a time cycle from the molding stations to a pouring position in the background of Fig. 2. The adjacent melting department operates 18 oil-fired tilting furnaces; 14 of these are 650-lb capacity and 4 are 1000-lb capacity units. In addition, two 1500-lb capacity reverbatory furnaces are employed to melt down return scrap. Fig. 4 shows one side of a double line of the 650-lb furnaces. Thermocouples seen suspended over these units lead to a central control room nearby where recording pyrometers keep an accurate check on temperatures of individual melts. Following the meltdown and fluxing the metal may be transferred to one of the 350-lb capacity holding furnaces serving the bench foundry, or it may be moved upstairs to the permanent mold foundry, or taken to a side floor for pouring the larger molds.

Each of the two bench foundry loops has six oil-fired holding furnaces, several of which are shown in Fig. 6 with metal being transferred in a 400-lb capacity ladle. Poured molds on the train conveyor are in the foreground. Transfer ladles operate on an overhead electric monorail system from the melting room to the pouring floor.

After the molds have been poured the conveyor train proceeds to the shakeout position shown at the right in Figs. 2 and 3. Here the jackets are removed and the molds are dumped on a long grating through which the sand falls onto a conveyor belt below the floor. Bottom boards are returned to the train, and castings are placed in cars on the main conveyor line extending alongside the shakeout station, as shown in Fig. 2. A branch of the conveyor line at this point permits the conveyor cars to be held until they are loaded. Castings are sorted here, those of the same type being placed in individual cars.

The belt conveyor returns sand from the shakeout to a central sand preparation system serving the two bench foundry loops. This sand system comprises the usual equipment employed in synthetic molding sand practice, including screen, aerator, mixer and storage bin. Mixed sand is distributed by overhead belt conveyor and plowed off at molding station hoppers. A duplicate system handles sand requirements of floor and machine molders producing molds for larger castings, this sand also being delivered by overhead belt.

Molds Made on Machines

Machine molding on larger work is conducted at six stations of the type shown in Figs. 10 and 14. These extend along one side of the sand foundry. Each station is provided a jar rollover, pattern draw molding machine, the units including one of 750 lb capacity, two of 1500, one 3000, one 6000 and one 10,000 lb. Other molding facilities for the larger castings consist of a stationary sand-slinger, used to ram copes, and a motive type slinger (Fig. 12). The latter operates on a track located on the opposite side of the floor from the rollover machines.

The sand foundry has standardized on nine sizes of flasks, the smallest being 20 x 20 in. and the largest 60 x 60 in. Majority of flasks used are aluminum.

Rollover machines receive sand from overhead hoppers, as shown at the top of Fig. 10. To avoid interference with the jib crane located at each station the hopper gate is higher than usual, but sand is guided into the flasks by a large funnel which can be swung into position as required. Molds are set out for pouring on a gravity roll conveyor which encircles each station and leads to a shakeout. There are three shakeouts, each serving two adjoining molding stations, and each is provided an effective exhaust hood, such as shown in the background of Fig. 10. The hooded area also extends beyond the shakeout to trap smoke and fumes from poured molds approaching the

(*Concluded on page* 158)

the wheel

High speed resinoid bonded—for portable grinding operations in foundries, steel mills and general industry—Borolon abrasive for steel castings—Electrolon abrasive for gray iron and non-ferrous castings. In every required wheel size and shape, including straight, cups and cones.

the grinding job

Offhand snagging large steel casting with high speed portable pneumatic grinder using Borolon resinoid bonded abrasive wheel A16-Q6-B2, size 8″ x 1″ x 5/8″. This is production work of the toughest kind . . . requiring fast cutting action, heavy stock removal and long wheel life.

Borolon ALUMINUM OXIDE — *Electrolon* SILICON CARBIDE

SIMONDS ABRASIVE CO.

PHILADELPHIA, PA.

Grinding Wheels

where to get it

From your Simonds Abrasive Co. Distributor located in all key industrial centers here and in many foreign countries. He stocks Simonds Grinding Wheels for every grinding job and can advise on grinding wheel selection. Write for name and address of distributor serving your area. Also request special bulletin, "Safe Operation of Portable Grinders".

Every size and shape for every grinding job . . . centerless, crankshaft, cut-off, cylindrical, internal, knife grinding, mounted points, portables, roll grinding, saw gumming, snagging, surfacing (wheels and segments), tool and cutter, bricks, sticks, stones and abrasive grain for polishing, pressure blasting, anti-slip, etc.

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Wherever grinding figures in your manufacturing operations you can count on Simonds Abrasive Company Grinding Wheels for the kind of performance that 'ups' production and cuts costs. Complete quality control governs these production tools—beginning with crude abrasive produced by our Canadian electric furnace plant, Simonds Canada Abrasive Co., Ltd., and continuing through to the finished wheels stocked by our distributors. This, plus more than 50 years experience as a leading manufacturer of grinding wheels and abrasive products exclusively, enables Simonds Abrasive Company to offer you top wheel performance duplicated each time you buy Simonds Grinding Wheels.

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(*Concluded from page* 156)

shakeout. Sand from the shakeout is returned to the preparation unit by underground belt conveyor.

Fig. 20 shows one section of the rough trim department, the first stopping point for castings leaving a shakeout. Rough castings arrive at one of the six band saws over the conveyor line just visible in the upper left-hand corner of this illustration. Gates and risers sawed off here are shoved forward and drop down a chute into a scrap hopper located in a pit, while castings are loaded on a car of the tote pan conveyor shown at the operator's left. When the scrap hopper is full, a turn of the lever of the mechanism shown just above the pit automatically ejects the hopper from the station and it is picked up by another conveyor to be returned to the melting department. At the same time an empty hopper is automatically moved into position below the saw chute.

Castings Travel in Sequence

From the rough trim operation castings are transported on tray type cars to the final trim and finishing stations, shown in Figs. 21 and 22, where both stand grinders and flexible shaft grinders are employed. Path of the conveyor in this department is such that the castings travel in sequence to successive benches for required finishing. Two sand blast tables are used in cleaning larger castings preparatory to final finishing. From the finish trim department castings move to the inspection and shipping departments.

Meanwhile hoppers of scrap have proceeded to the melting department where they roll onto the free conveyor line shown at the right in Fig. 17. This line leads to a hoist which automatically raises the car to the level shown here, from where it rolls on another free line through the door at the left to a storage area. There it is dumped and the car then continues back into the main conveyor system on the other side of the wall. Each car of scrap is weighed as it reaches the melting department, a section of the conveyor line being equipped with a scale for this purpose.

Ingots alloyed to the correct analysis for charging into the melting furnaces are made in the fourth main building, which also houses the maintenance department. Four reverbatory furnaces are operated, two of 20,000 lb capacity and two of 35,000 lb. The furnaces are tapped continuously, the molds water-cooled and the ingots are stacked for delivery by lift truck to the nearby storage area. Trucks also are used in transporting ingots from storage to melting furnaces.

The permanent mold foundry, capacity of which is greater than that of the sand foundry, produces castings ranging in weight from less than an ounce to a maximum of usually 25 to 30 pounds. In exceptional cases the weight has exceeded 100 pounds. The department, located on the third floor of a building adjoining the sand foundry, has 15 work locations, one of which is shown in the partial view of the floor in Fig. 19. Thirty 350-lb capacity holding furnaces are available, and hot metal is received in 400-lb capacity ladles by elevator as described previously. Fig. 5 illustrates the ladle about to be raised from the melting department to the permanent mold floor where it is delivered onto the monorail system leading to the various holding furnaces and the metal transferred.

The main power conveyor also serves this floor, bringing up cores and taking away castings. Fig. 15 shows conveyor cars on a gravity loop where they remain during hot inspection and loading of permanent mold castings before being returned to the power conveyor for delivery to the rough trim department downstairs. The point at which the cars are switched over is illustrated in Fig. 16, with the descending line just visible in the lower righthand corner. All permanent mold castings do not go directly to the finishing department, since in some cases special machine setups have been devised at one end of the casting floor for removing gates and risers, rather than by the band-saw method.

Operate Machine Shop

The company operates a sizable machine shop for making and repairing permanent molds. This shop is located on the first floor of the permanent mold foundry building and is made especially attractive by use of the modern color scheme for machines and walls. This same floor also is used for pattern storage, in addition to housing excellent first aid and medical facilities. Other departments which help to make this foundry an integrated unit are an engineering and drafting department to handle permanent mold design work; new laboratory facilities with the latest equipment for physical and chemical testing, and a complete laboratory for sand testing.

Supplier of this first foundry installation of the casting, core and scrap conveyor system described here was the Jervis B. Webb Co., Detroit.

Book Review

Molybdenum—Steels, Irons, Alloys by R. S. Archer, J. Z. Briggs, and C. M. Loeb Jr., cloth, 391 pages, 6 x 9 in., published by Climax Molybdenum Co., New York. Free distribution to metallurgists and others closely connected with metallurgical industries.

The varied applications of molybdenum as an alloying element are described in this book, which covers a wide range of materials from wrought to cast steels and from cast iron to nonferrous alloys. Major emphasis has been placed on the presentation of the fundamentals that must guide all engineers, designers and metallurgists in their selection of the most suitable materials for a given application.

An attempt has been made to show the fields of similarity and dissimilarity of the various materials and to indicate some of the factors that may affect the choice of the most economical material for a specific part.

Considerable recent information is included, not only on the more prominent developments, such as gas turbine steels and alloys, but also on work that has served to clarify factors affecting the service life of the lower alloy steels.

Issues Production Bulletins

American Management Association, 330 West 42nd St., New York 18, has published informative bulletins in the Production Series, available at the prices indicated: "Guides to Management Operating Policy," 50 cents; "Organizing for Efficient Production," and "Planning and Administering Effective Incentives," 75 cents each; "Production Costs and Breakeven Points," "Labor-Management Co-operation for Increased Productivity," "Modernizing Manufacturing and Production Controls," $1 each. In the Packaging Series "Fitting the Shipping Container to the Products," and "Better Export Packaging—Improved Loading," 50 cents each.

New Film Available

"Grinding and Use of Basic Lathe Tool Cutter Bits" is the title of a new 16 mm colored sound film recently released by South Bend Lathe Works, 299 East Madison St., South Bend 22, Ind. Film shows the proper steps for grinding and using cutter bits for lathe operations, and is distributed on a free loan basis or available for purchase.

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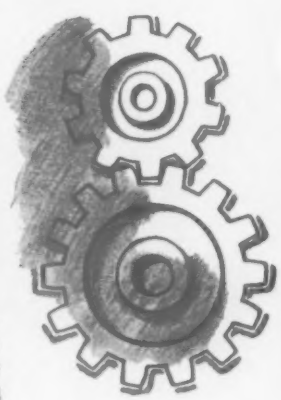

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ACTIVITIES OF FOUNDRY Groups

Tennessee

TENNESSEE Chapter of the AFS held its first annual barbecue Aug. 28 at Signal Mountain Golf and Country Club, near Chattanooga, Tenn. Karl Landgrebe, Wheland Co., Chattanooga, was general chairman of the outing, and Paul Arnold, U. S. Pipe & Foundry Co., Chattanooga, was co-chairman.

Out-of-town guests included Clifford B. Cornell, Cleveland Flux Co., Cleveland, and Sidney S. Keywood, Harnischfeger Corp., New Orleans.

On Sept. 17 the chapter met at Hotel Patten, Chattanooga, for its first technical meeting of the year, with approximately 100 members and guests present.

Guest speaker for the evening was W. B. McFerrin, Electro Metallurgical Co., Detroit. Mr. McFerrin spoke on "Casting Defects." His talk, which was illustrated by slides, covered the various types of casting defects, their causes, and how such defects could be remedied.

At the conclusion of the lecture, Mr. McFerrin participated in a question-and-answer session, highlighted by his discussion of the "carbon equivalent."—*Carl A. Fischer Jr., Equipment & Supply Co.*

Chicago

THREE roundtables initiated the 1948-49 season meeting program of the Chicago Chapter, AFS, on Oct. 4. As in recent years the dinner meetings are held in the facilities of the Chicago Bar Association. Group sessions continue to enjoy popularity, for the opening program attracted an attendance of over 230 members and guests.

Chapter President Chester K. Faunt, works manager, Christensen & Olsen Foundry Co., Chicago, presided at the general portion of the program, assisted by Vice President W. D. McMillan, metallurgist, McCormick Works, International Harvester Co., Chicago. Deming H. Lucas, manufacturers agent, Chicago, and chairman of the membership committee, reported briefly on activities of his group since the last chapter year.

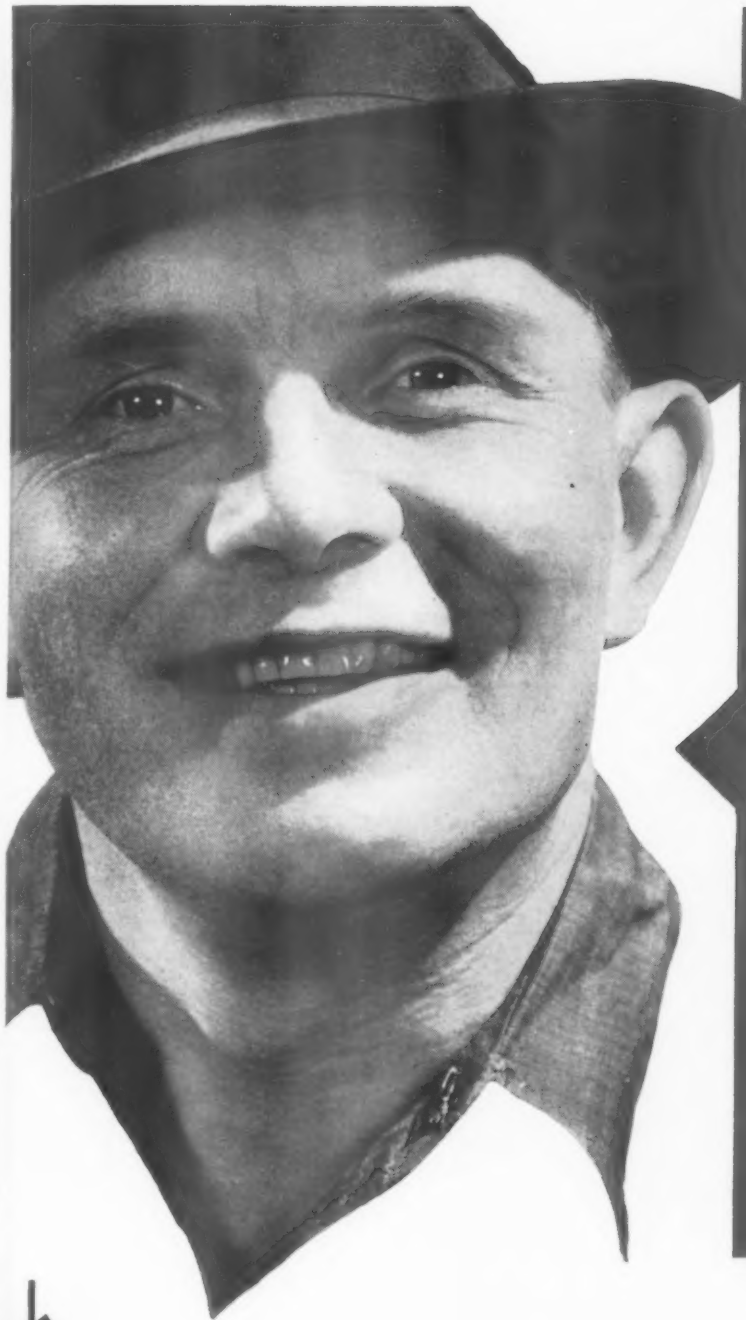
One of the roundtables was conducted by the nonferrous group, malleable and gray iron groups met jointly in the second, and the steel and pattern groups joined in the third.

W. J. Phillips, manager, castings development department, Steel Founders' Society of America, Cleveland, in addressing the steel and pattern roundtable on the subject of "New Steel Casting Applications," suggested to his listeners that to hold their markets against encroachment they must regard their products as parts rather than steel castings, as such. While admitting that a prime reason for loss of business to other manufacturing processes, particularly fabrications, is occasional low level of casting quality, with the need for subsequent excessive machining, he said it is possible that a poor quality casting will make a good part in certain applications. Thus, while a casting may have shrinkage cracks at some points, these might not affect performance of that part.

What foundrymen and patternmakers must do to hold on to old business and expand the use of castings to new fields is to apply design re-

(*Continued on page* 162)

TENNESSEE Chapter of the AFS held its first annual outing Aug. 28 at Signal Mountain Golf and Country Club, near Chattanooga, Tenn. Pictures are by courtesy of Frank Robbins, Ross-Meehan Foundries Inc., and Paul Arnold, U. S. Pipe & Foundry Co., both of Chattanooga



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(*Continued from page* 160)

sourcefulness to the part, planning its manufacture in relation to the functions it is to perform in the piece of equipment where it will be used. This new approach, Mr. Phillips explained, has already resulted in successful use at lower cost of steel castings in parts which traditionally have been made by other processes. James Gammie, general foreman, pattern department, American Steel Foundries, East Chicago, Ind., presided at this group meeting.

The malleable and gray iron roundtable heard William C. Wick, Armour Research Foundation, Chicago, discuss "Oxygen Enriched Cupola Blast." This session, presided over by Walter R. Jaeschke, engineer, Whiting Corp., Harvey, Ill., abounded in discussion, mostly of the question and answer type.

"Nonferrous Melting Equipment" was the subject of the Nonferrous group roundtable with J. L. Stroman, manager, Stroman Furnace & Engineering Co., Division of Petersen Oven Co., Chicago, as speaker. Martin G. Dietl, nonferrous metallurgist, Crane Co., Chicago, was chairman.

Next chapter meeting, Nov. 1, will be "National Officers' Night." Speaker for this occasion will be Carl Taylor, president, Waukesha State Bank, Waukesha, Wis., and his subject "America Tomorrow."—*Erle F. Ross.*

Pittsburgh

PITTSBURGH Foundrymen's Association held its initial meeting of the 1948-49 season, Sept. 20, at Fort Pitt Hotel, Pittsburgh.

Guest speaker was R. G. McElwee, manager, Iron Foundry Division, Vanadium Corp. of America, Detroit. Mr. McElwee discussed the utilization of inoculants in foundry practice, pointing out that a strict classification of elements into groups of alloys or inoculants is not possible because an element may function both ways, depending on quantity considered. He cited as an example that silicon may be considered as an alloy when used for hardening ferrite, which it does when C+⅓ Si is over 4.3 per cent. On the other hand, it is an inoculant when added to the ladle in amounts of .25 per cent or less.

Similarly, all of the elements can have various effects, depending on time of addition and amount used.

One point to be emphasized, Mr. McElwee stated, is the effect of the silicon level of the charge on carbon pick-up in the cupola. It is generally considered that each 4 points of silicon has an inverse effect of 1 point of carbon. If the amount of the silicon in the charge, for example, is reduced by .20 per cent, it can be expected that the carbon will be raised by .05 per cent automatically and with no other change involved.

The importance of high carbon in minimizing shrinkage was mentioned, and it was pointed out a reduction of silicon will result in any reasonable strength specifications being met with high-carbon iron. In the matter of using relatively poor quality raw materials available today, it was suggested that additional supervision would do much to keep analysis under control. Placing of the charge, discarding of coke fines, and careful adjustment of air volume were among the points discussed. — *Joseph C. Sullivan.*

BIRMINGHAM Chapter of the AFS held its fifteenth annual outing Sept. 11 at Roebuck Country Club, Birmingham. Outing pictures, reproduced above, are by courtesy of Bill McCollough, American Cast Iron Pipe Co.

Wisconsin

WISCONSIN Chapter of the AFS held its second fall dinner meeting on Oct. 8, at the Hotel Schroeder, Milwaukee, with sectional meetings of various groups in five parlors of the hotel after dinner. A total of 229 members and guests attended, which, as president Robert Woodward put it from the chair, is 43 per cent of the membership. This is not a high point for attendance, however, as most dinner meetings have attracted up to 300.

President Woodward announced the approval of several applications for membership. As usual, most of the living ex-presidents of the Chapter were present. One who is missed at these dinner meetings is John Bing, recently transferred to New York. A new song leader has been chosen.

All of the technical sessions were well attended, many preferring to hear a talk on "Nonferrous Precision Castings" by George A. Stolze of the Allis-Chalmers Mfg. Co., who showed a film giving a step-by-step description of the process.

(*Continued on page* 164)

It stops profit leaks in the cleaning room

LIKE A CHAIN that is no stronger than its weakest link, a foundry can not attain peak efficiency—and earning power—with jumbled piles of castings strewed around the cleaning room.

In most foundries the time and the cost of handling castings from the shakeout through the cleaning room can be—and should be reduced.

Apron Conveyors of proper design, and properly used, permit cleaning room and inspection operations to be synchronized with the tonnage passing over shakeouts—eliminate re-handling—and produce an orderly "flow" of castings similar to the controlled flow of sand through a sand conditioning plant—or to the control of molding, pouring, cooling and shaking out made possible with a run-around mold conveyor.

Slow speed Apron Conveyors, with or without hoods, provide one of the few generally approved methods of cooling castings from shakeout temperatures of around 1500°F., to the temperatures required for mill cleaning or hand sorting.

Apron Conveyors with heavy duty flat tops and no sides, that permit the easy loading and unloading of castings, make ideal chipping conveyors.

Let the Bartlett-Snow engineers, with their wide familiarity with the needs of practical day to day foundry operation, work with you in making your cleaning room as efficient and smooth running as other parts of your foundry. The C. O. Bartlett & Snow Company, Cleveland 5, Ohio. Engineering representatives in New York, Baltimore, Detroit, Chicago.

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For the Foundry Industry

SAND, MOLD AND CASTINGS HANDLING EQUIPMENT

(*Continued from page* 162)

The other subjects and speakers were:

"Production and Use of Pig Iron," by Ed Mathis, Pickands Mather & Co., for the gray iron group audience.

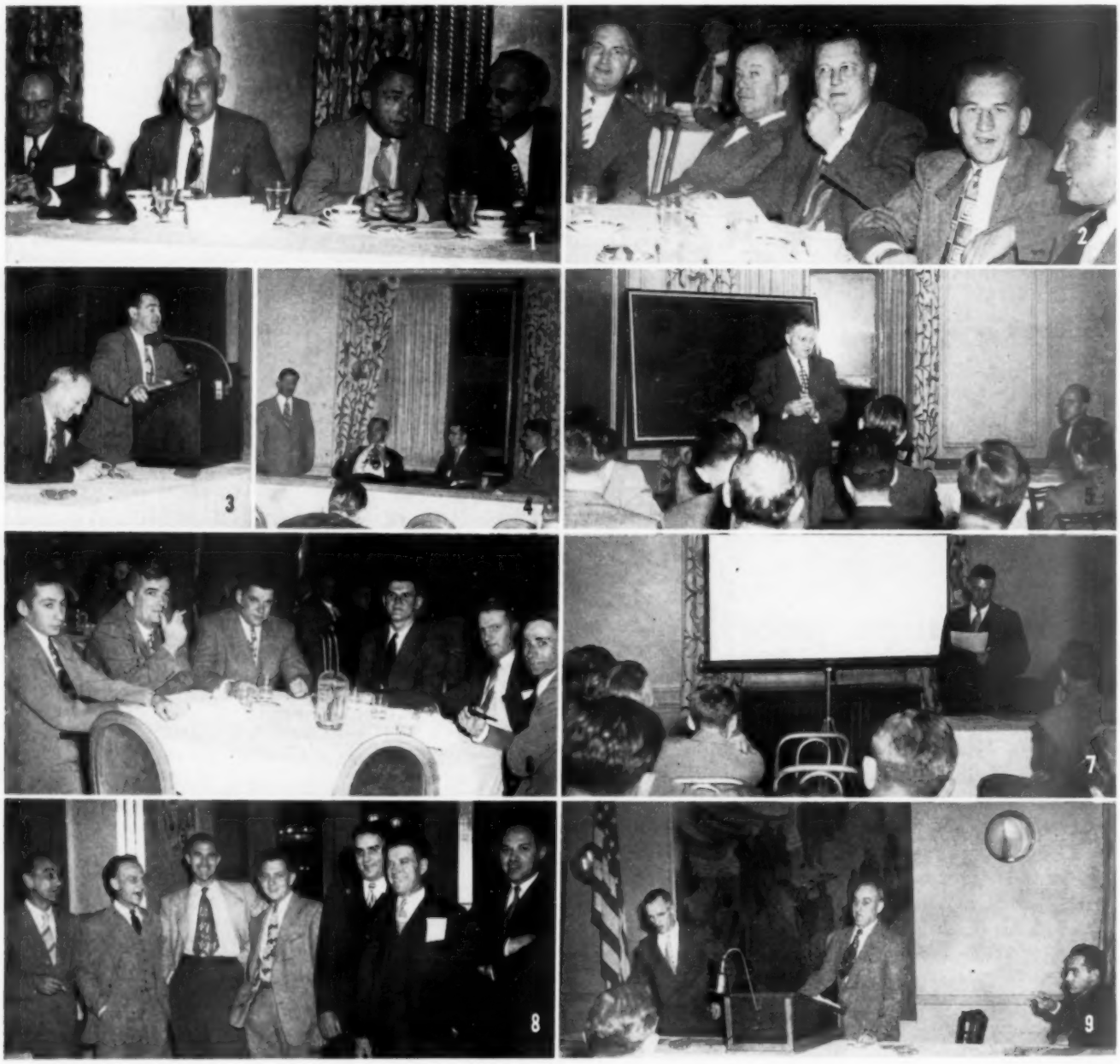
"Factors Influencing the Behavior of Sand," by J. A. Rassenfoss, American Steel Foundries, for the steel group.

"How to Choose the Best Grinding Wheel," by J. W. Pfaffi, Belle City Malleable Iron Co., for the joint session of the malleable and technical groups.

"Pattern Lumber," illustrated with sound film, by B. M. Davis, Forest Products Laboratory, University of Wisconsin, Madison, Wis., for the pattern section.

Chapter committees have been selected for the coming year. Chairmen of the various committees are as follows: General program committee, George E. Tisdale with Joseph G. Risney as co-chairman; pattern, Albert Huebner with Leonard Gratz co-chairman; malleable, P. J. Anderson with E. B. Hansen co-chairman; gray iron, Harold Sohner with George Antonec co-chairman; nonferrous, C. Kotowitz with A. R. Tooman chairman; steel, Charles Fuerst with O. H. Kraft co-chairman; technical, B. H. Booth with R.

(*Continued on page* 166)



WISCONSIN Chapter of the AFS met Sept. 10 at Hotel Schroeder, Milwaukee, for its first meeting of the season. Shown above in view 1., left to right are: R. J. Anderson, Belle City Malleable Co., past president; Robert C. Woodward, Bucyrus-Erie Co., president; Arthur C. Haack, Wisconsin Gray Iron Foundry Co., vice president ,and Walter Edens, Badger Brass & Aluminum Co., secretary. 2. Informal group. 3. J. P. Moran, Induction Heating Corp., addressing the gray iron and malleable groups. 4. R. Beam, Dixon Crucible Co., addressing the sectional meeting of the nonferrous group. 5. F. C. Bond, Allis Chalmers Mfg. Co., addressing the technical group. 6. A group of new members from Stainless Foundry & Engineering Co. 7. C. H. Wyman, Burns de Steel Foundry Co., speaking before the steel group. 8. Group from Pelton Steel Co. 9. V. E. Ziemer, Maynard Electric Steel Casting Co., addressing the pattern group

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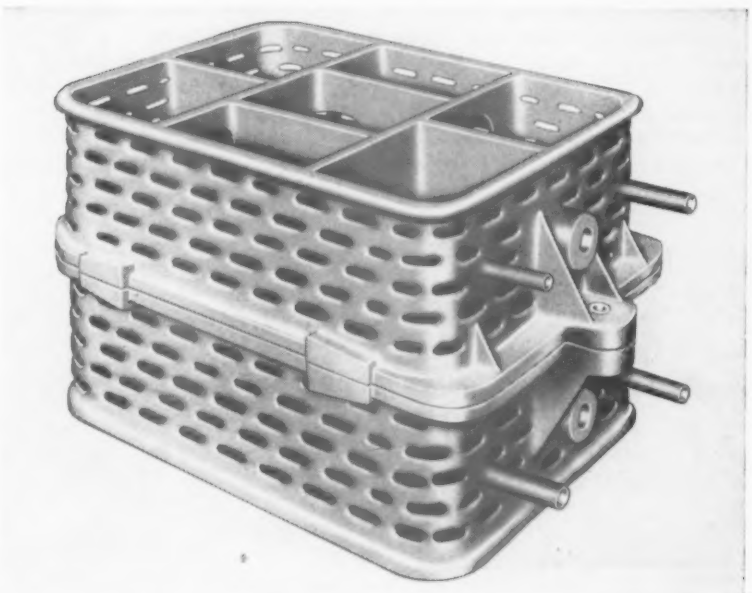

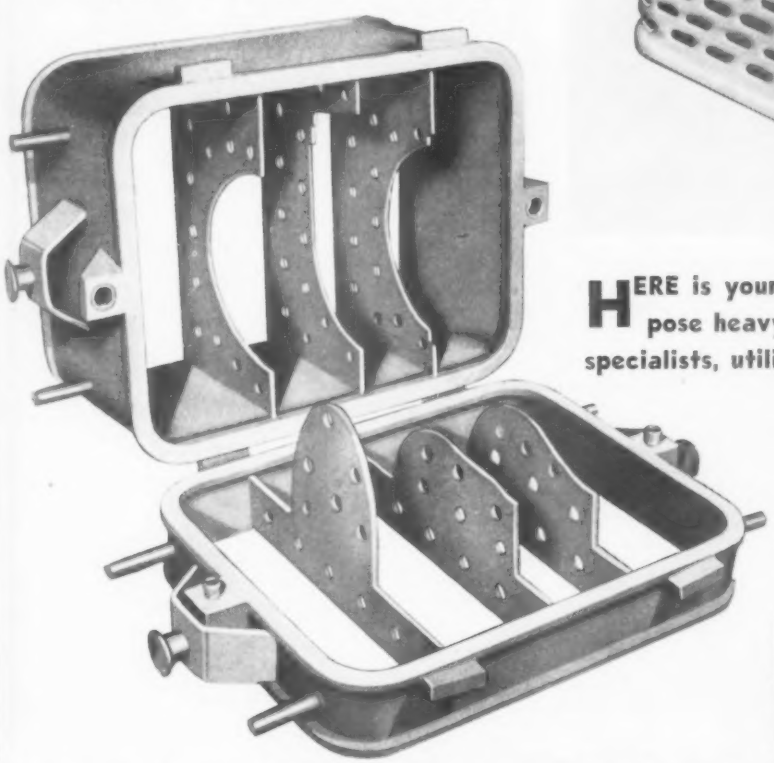

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(*Continued from page* 164)

McIntosh co-chairman; annual conference, A. C. Haack, with Walter W. Edens co-chairman; apprentice, Andrew Bottoni with E. D. Fahlberg co-chairman; arrangements, Harold O. Boehm with Frank M. Jacobs co-chairman; audit, Ralph Lee with Clarence Gehrman co-chairman; entertainment, Leo B. Koenig with Frank M. Jacobs co-chairman.

Also safety and hygiene, Arthur Grede with C. R. Gutenkunst co-chairman; golf, J. V. Olle with M. A. Knoller and S. E. Shaver co-chairmen; nominating, David C. Zuege with R. J. Anderson co-chairman; publicity, Frank M. Jacobs; membership, E. C. Meagher with Marvin Knoller co-chairman; policy, R. J. Anderson; old timers and apprentice, Leon Decker; education, A. C. Haack with W. W. Edens co-chairman; student aid, H. E. Ladwig with A. C. Ziebell co-chairman; historical, J. A. Leisk with J. J. McDevitt co-chairman; reception, A. M. Hermann with R. A. Smith co-chairman; finance, R. J. Anderson. The official photographer is Walter V. Napp.—*John E. Hubel*

Northwestern Pennsylvania

NORTHWESTERN Pennsylvania Chapter of the AFS held its third annual picnic and golf tournament, Sept. 11, at Tieman's Grove near Erie, Pa.

The committee arranged a good old-fashioned picnic which included a continuous buffet lunch, refreshments and such contests as egg throwing, watermelon rolling, horseshoes and other activities. And, of course, there was the Lake Shore Golf Club to interest the golfers.

Committee in charge of the affair was composed of F. Carlson, Weil-McLain Co.; W. Bartles, Erie Malleable Iron Co.; R. Carver, Standard Stoker Co.; S. Stroup, Peerless Mineral Products; C. Wilcox, Cascade Foundry Co.; H. Lolley, Bucyrus-Erie Co.; F. Volgstadt, Griswold Mfg. Co. and J. Farina, American Sterilizer Co., all of Erie.

The grand prize, a portable radio, was won by Earl Strick, Erie Malleable Iron Co., Erie—*James J. Farina, American Sterilizer Co.*

Birmingham

BIRMINGHAM Chapter of the AFS held its fifteenth annual outing Sept. 11 at Roebuck Country Club, Birmingham. About 750 members and guests attended. D. C. McMahen was general chairman of the outing with J. R. Reynolds, J. M. Bates and Guy Bagley in charge of ticket distribution. William Bach, Gene Welchel and Joe T. Gilbert arranged the sports program.

At a recent meeting of the board of directors the chapter's business

(*Continued on page* 168)

NORTHEASTERN OHIO Chapter of the AFS opened the 1948-49 season with a clambake dinner at the Cleveland Club, Cleveland. Some views of the meeting are shown here. At upper left, l-r, are: Howard Gollmar, Elyria Foundry Division, past president; Walter Sicha, Aluminum Co. of America, president, and L. P. Robinson, Werner G. Smith Co., speaker. Photos by Sterling Farmer, Sand Products Corp.

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Then there's the test of time. Experience built up in the course of 84 years enables "U. S." to solve current wheel problems of every type—and to anticipate future problems brought on by higher production quotas and new manufacturing techniques.

As a result, whether you're snagging castings, grinding ball races or working with billets, bits, slabs or sauce pans, you'll find a U. S. Royalite Wheel carefully *engineered to your job*. In addition, "U. S." field engineers, by thorough testing right in your own plant, can give you accurate grinding wheel costs *in advance*.

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When this midwestern iron foundry adopted high speed snagging 17 years ago, it picked U. S. Royalite Wheels. It has been using them ever since on the basis of their superior performance.

U. S. ROYALITE GRINDING WHEELS

ENGINEERED TO YOUR JOB

(*Continued from page* 166)
for the coming year was organized. E. Armand Thomas was named chairman of the education committee to succeed C. P. Caldwell. Donald Abbott, membership chairman, announced that 41 new members were secured since the last meeting and that 11 new applications were on file.

J. A Bowers reported on his trip to Chicago where he represented the chapter at the chairmen's meeting. —*J. P. McClendon, Stockham Pipe Fittings Co.*

No. Illinois and So. Wisconsin

NINETY members and guests of Northern Illinois and Southern Wisconsin Chapter of the AFS attended the regular chapter meeting at Faust Hotel, Rockford, Ill., Sept. 14.

Officers for the current season were announced. They are: Chairman, H. J. Bauman, Smith Oil & Refining Co.; vice chairman, L. C. Fill, George D. Roper Corp.; secretary, F. W. Thayer, Gunite Foundries Corp., and treasurer, C. L. Dahlquist, Greenlee Bros. & Co., all of Rockford.

After a brief sound movie on Mechanized Cupola Charging," Ford R. Snyder, metallurgist, Hickman, Williams & Co., gave a down-to-earth talk on "Controls of Cupola Operation." Emphasis was on the value of simple controls in overcoming difficulities arising from uncertain quality of pig iron, scrap and coke as well as in attaining maximum economy.—*Upton E. Bartlett.*

New England

NEW ENGLAND Foundrymen's Association resumed its normal schedule of monthly meetings Sept. 8 at the new quarters of the Engineers Club, 96 Beacon St., Boston. Seventy-eight members and guests were present for the first meeting.

Speaker of the evening was Dickey Dyer, Dyer Engineers Inc., Cleveland, industrial management consultants, whose subject was "Measurement, Incentive, and Control for Jobbing Foundries." Payroll savings of between $600 and $800 per employee per year were reported by Mr. Dyer, as he presented diagrams of the accomplishments of three jobbing foundries employing 74, 139 and 185 men.

He emphasized that the successes illustrated had been achieved because the managements involved had selected a well designed managerial tool, had delegated a qualified executive for training in its operation, and had made certain of its constant and effective use. He focused attention on the diminishing supply of young foundry labor, and proposed the solution of "putting workers in business for themselves" with a realistic incentive plan.—*Walter M. Saunders Jr.*

Cleveland Non-Ferrous

OPENING meeting of the Cleveland Chapter, Non-Ferrous Founders' Society was held at Hotel Cleveland, Sept. 16. D. B. Kennedy, Gluntz Brass & Aluminum Foundry Co., and chairman of the group, presided. William Gluntz of the same firm and a national director of the society spoke briefly on the various activities in behalf of the membership.

Principal speaker was W. M. Ball Jr., R. Lavin & Son, Chicago, who discussed "Human Engineering." He pointed out that each individual is more or less subject to the same mental traits, feelings, actions and attributes such as ambition, honesty, fear, sensitiveness, worry, determination, faith enthusiasm, etc. Recognition of these factors, and placing one's self in the other fellow's position will aid immeasurably in improvement of labor relationship.

Philadelphia

PHILADELPHIA Chapter of the AFS is sponsoring an elementary foundry lecture course at Murrell Dobbins Vocational Technical School, 22nd St. at Lehigh Ave., Philadelphia 32. The course, started Sept. 27, is a 20-week program consisting of lectures on various phases of foundry work given by outstanding men in the field. Films or visual aids are used at all lectures. There is no charge for the course.

The program is under the direction of the chapter's educational committee. Chairman of the committee is A. C. Gocher, Fletcher Works Inc.; co-chairman, B. A. Miller, Baldwin Locomotive Works, and secretary, H. E. Mandel, Pennsylvania Foundry Supply & Sand Co., all of Philadelphia.—*J. L. Furey, Swan-Finch Oil Corp.*

Quad City

QUAD City Chapter of the AFS held its first meeting of the 1948-49 season Sept. 20 at Fort Armstrong Hotel, Rock Island, Ill. About 125 members and guests attended the dinner and technical session which followed.

W. R. Jaeschke, consultant, Foundry Equipment Division, Whiting Corp., spoke on "Cupola Melting Control." He used slides to explain the theory and results developed in research on various methods of cupola melting and outlined methods of obtaining closer control of melting through proper selection of the charging equipment and materials.

Discussion by members brought out many methods of overcoming poor quality of materials by the selection of better melting and charging equipment.—*C. R. Marthens, Marthens Co.*

Central Indiana

APPROXIMATELY 150 members and guests attended the first meeting of the season held by Central Indiana Chapter of the AFS, Oct. 4, at the Athenaeum, Indianapolis. Principal speaker was Ford R. Snyder, Hickman-Williams Co., Chicago, whose topic was "Correct Cupola Practices."

Mr. Snyder's talk was highlighted by a printed form describing proper methods of cupola starting, which was distributed preceding his address, and by blackboard diagrams and illustrations during the talk. He gave much detailed information on latest cupola developments designed to be of aid particularly to the jobbing foundry.

Chester Sears, assistant foundry metallurgist, International Harvester Co., Indianapolis, acted as technical chairman. He introduced the speaker and led a 45-minute question-and-answer session following the address.—*William K. Mitchell.*

Central Ohio

ANNOUNCEMENT has been made of appointment of chairmen and committees for the Second Ohio Regional Foundry Conference to be held in Columbus, Mar. 11-12. The conference is sponsored by the five Ohio chapters of the American Foundrymen's Society and the Ohio State University. General conference chairman will be D. C. Williams, assistant professor, Department of Industrial Engineering, Ohio State University.

Chairmen of the various committees are as follows:

Program: Chairman, Dan E. Krause, general manager, Gray Iron Research Institute, Columbus. Vice Chairman, Norman J. Dunbeck, vice president, Eastern Clay Products, Jackson, O., and a national AFS director.

Registration: Fred W. Fuller, Westerville, O., special representative in northern Ohio for National Engineering Co., Chicago, and chairman of the Central Ohio Chapter, AFS.

Housing, Dinners and Luncheons:

(*Concluded on page* 170)

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BY reducing casting make-overs and enabling smoother and faster machining operations.

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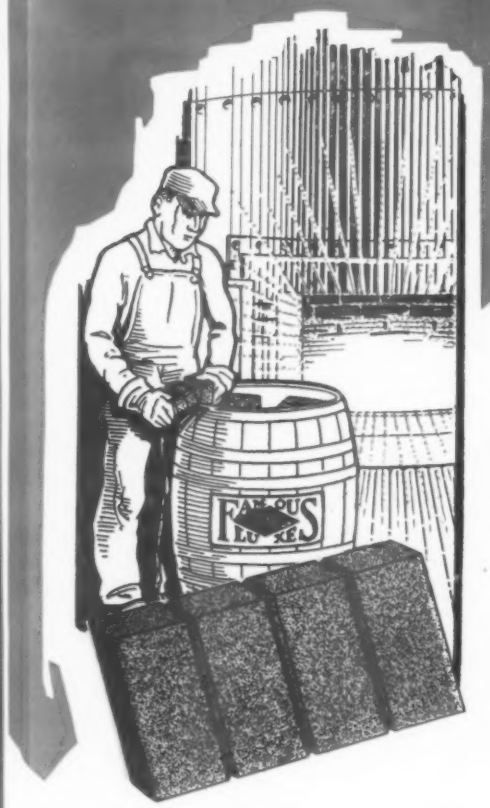
BY improving the quality of castings. Make-over time is greatly reduced—you can make better delivery.



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You simply toss Famous Cornell Cupola Flux into cupola for each ton charge of iron or break off a briquette (quarter section) for smaller charges. This flux does not blow out with the blast but STAYS in melting zone until entirely consumed, insuring full efficiency.

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WRITE FOR BULLETIN 46-B

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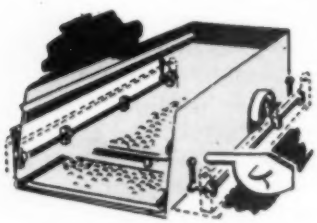

RIGHT HERE, SIR! is where the difference begins. SECO'S patented equalizer assembly (shown in cutaway) connects with the live body at four points to positively control the circular motion of the screen in operation. Bobbing, weaving and heaving just can't happen.

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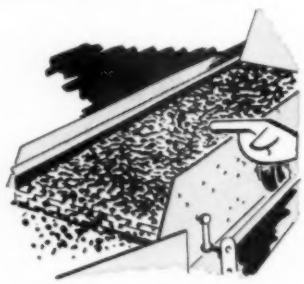

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SECO

SCREEN EQUIPMENT COMPANY, INC.
PRODUCERS OF VIBRATING SCREENS EXCLUSIVELY
Buffalo 21, New York
In Canada: United Steel Corp., Ltd., Toronto

(*Concluded from page* 168)

Walter Deutsch, Columbus Malleable Iron Co.

Finances: W. T. Bland, Commercial Steel Castings Co., Marion, O.

Publicity: J. G. Lummis, A. P. Green Fire Brick Co., Columbus.

Central New York

APPROXIMATELY 80 members and guests of the Central New York Chapter of the AFS attended a clambake held at Three Rivers Inn, Sept. 10. This was the chapter's first meeting of the season and no business or technical sessions were conducted. Purpose of the bake was to promote good fellowship and to give all members the opportunity to become better acquainted.—*John Feola, Crouse Hinds Co.*

NODULAR CAST IRONS

(*Continued from page* 95)

3.98; Si, 3.19; Mn, 0.78; S, 0.028; and P, 0.040 per cent was melted in a crucible furnace and cast, at a temperature of 1380° C into test-bars of four different sizes. A further similar melt was carried out, but in this case 28 grams pure cerium was added to the molten metal before casting. The two sets of bars gave the following percentage composition:

	Remelted Pig Iron per cent	Remelted Pig Iron with Cerium Addition, per cent
Total carbon	3.77	3.72
Silicon	3.05	3.13
Manganese	0.73	0.74
Sulphur	0.023	0.007
Phosphorus	0.039	0.038
Cerium	....	0.040

The mechanical properties of these two sets of bars are given in Table I. Unless it is otherwise stated, the transverse, deflection and tensile figures given in this paper for 2.1, 1.6, 1.2, 0.875 and 0.6 diam bars were obtained on bars cast and tested according to British Standard Specification 786/1938. The impact figures were obtained on bars tested according to British Standard Specification 1349/1947. Details of the dimensions of fatigue, damping and torsion test pieces are given in the appropriate sections.

The microstructures of all the untreated bars showed mixtures of undercooled and normal flake graphite in matrices of ferrite with some pearlite and the mechanical properties for this material, as shown in Table I, are at a relatively low level, as would be expected. On the other hand, the mechanical properties of

(*Continued on page* 172)

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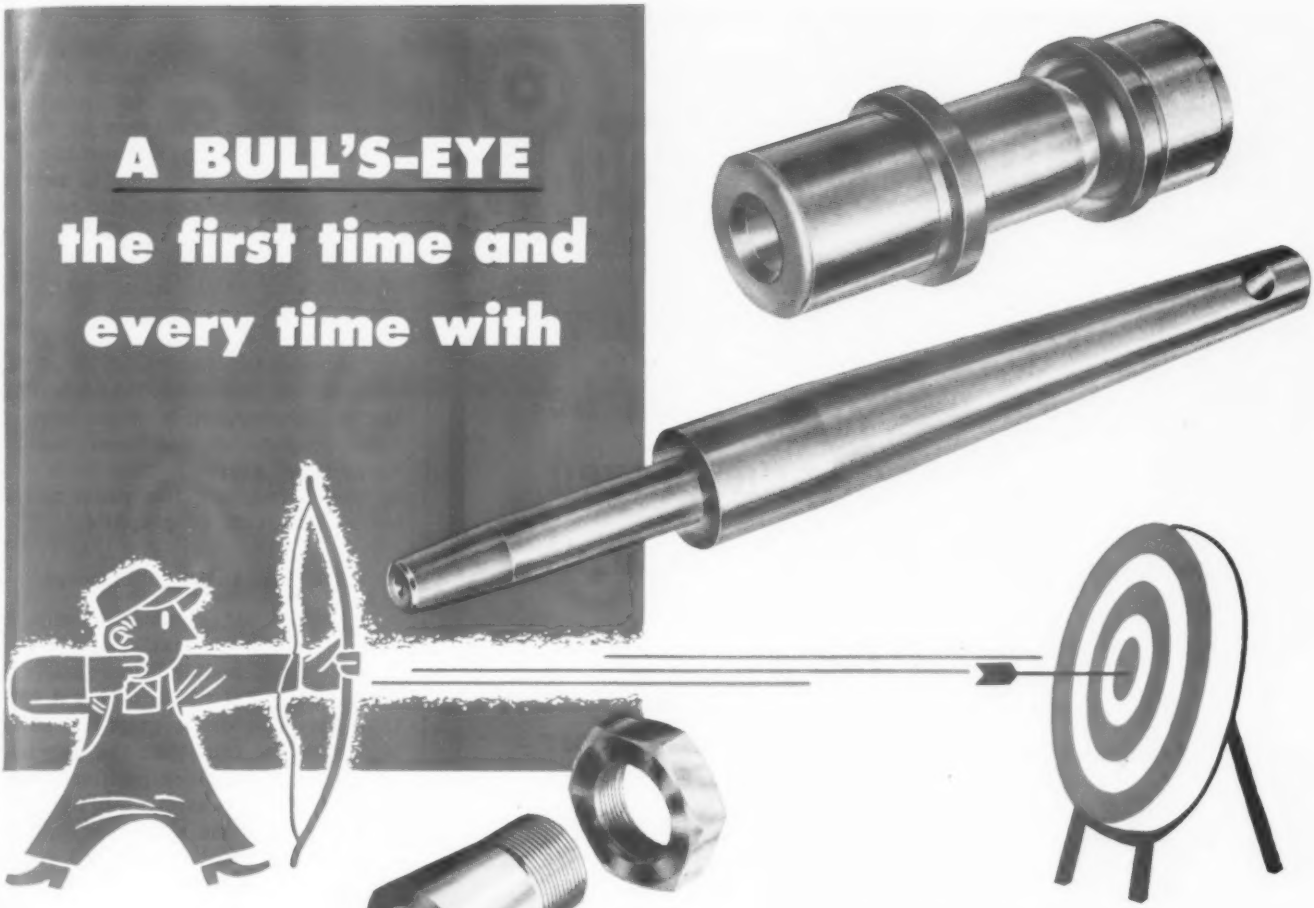

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Great Western Manufacturing Company

LEAVENWORTH, KANSAS

(*Continued from page* 170)

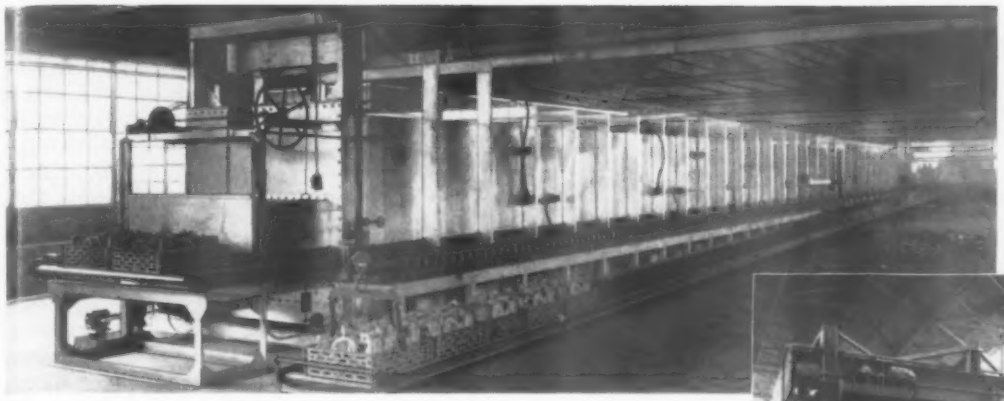
the bars cast from the treated material are at a very much higher level and immediately fall into the range of properties covered by high-duty cast irons. The microstructure of the treated 1.2-in. bar is shown in Fig. 2. The hypereutectic nodules can be clearly seen, together with a form of graphite somewhat resembling flake graphite in a matrix of ferrite with some pearlite. The "flake-form" of graphite is that resulting from the decomposition of the eutectic carbide after solidification and to distinguish it from normal flake graphite it has been termed "quasiflake" graphite. This term will be used throughout this paper to describe this form of graphite.

Examine Under Microscope

If Fig. 2 be examined closely, it will be observed that around each hypereutectic nodule there exists a volume of metal which does not contain any quasi-flake graphite. This is due to the fact that the graphite arising from the decomposition of the cementite immediately surrounding each hypereutectic nodule is deposited upon the nodule instead of giving quasi-flake graphite. This is made particularly clear when one of these nodules is examined at a high magnification—the inner nucleus of hypereutectic graphite surrounded by a distinct periphery of graphite deposited on it can be clearly seen. A typical instance of this is shown in Fig. 1 where a hypereutectic nodule in a cerium-treated hypereutectic iron is illustrated at a high magnification.

Irons of the type illustrated in Fig. 1 produced only by the simple addition of cerium, in some form or other, to the molten metal before casting, will usually have a microstructure consisting of a mixture of hypereutectic nodules, together with quasi-flake graphite. This process will be referred to as the "single treatment" process to distinguish it from a further elaboration of the process by which entirely nodular structures can be produced. As has been illustrated and described previously,[3,4] the form and shape of the quasi-flake graphite can vary considerably according to the amount of cerium present. With relatively low cerium contents the quasi-flake graphite is definitely in a flake-like form, but with relatively high cerium contents it tends to assume a nodular appearance, conferring a corresponding improvement in mechanical properties upon the resulting cast iron. Except in relatively heavy sections, it is not possible

(*Continued on page* 174)



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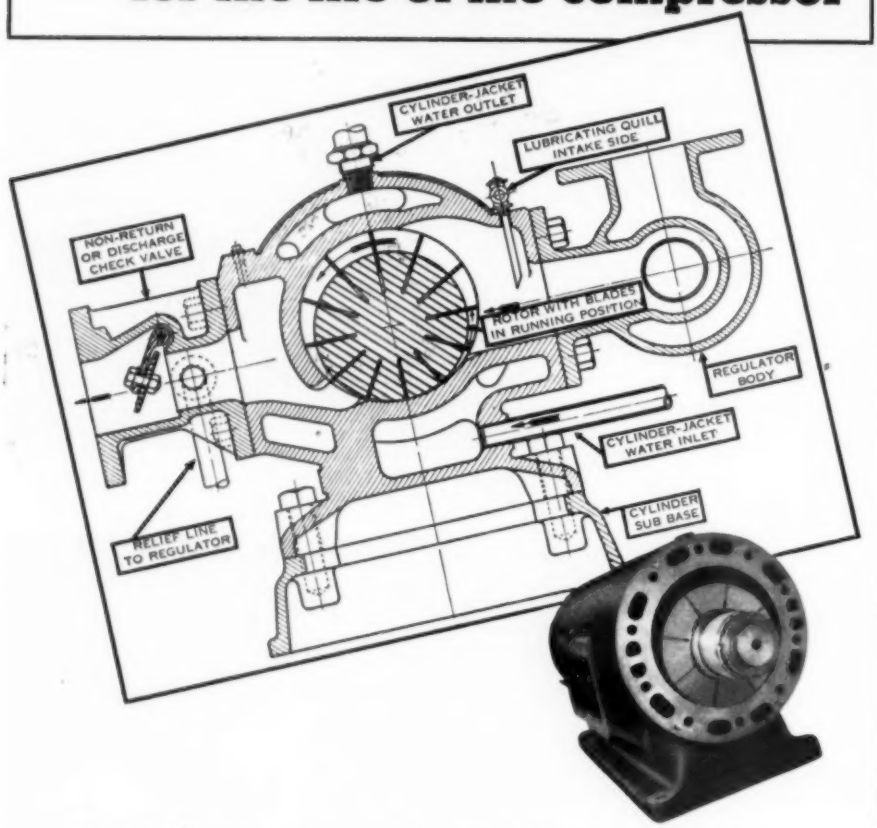

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C-167

Fuller

A LIFETIME OF NEW MACHINE EFFICIENCY

(*Continued from page* 172)

to utilize the latter effect of cerium because of its pronounced carbide stabilizing influence, which may cause the iron to remain white. For instance, if the cerium content of a ½-in. section, having a composition falling within the following range: T.C. 3.5 to 4.0; Si, 2.3 to 3.0; Mn, 0.5 to 1.5; S, 0.005 to 0.02; and P, 0.01 to 0.10 per cent, exceeds about 0.07 per cent, there is a serious danger that a white iron will result. It is obvious, therefore, that for the development of entirely nodular structures the process must be modified in some way to overcome this difficulty. This modification has been achieved by the introduction of what will be known as the "double treatment" process, which involves the addition of a graphitizing inocu'ant to the molten metal simultaneously with, or immediately after, the cerium addition. By this double treatment process it is possible to obtain entirely nodular structures with the development of a new high level of mechanical properties.

Explain Double Treatment

To understand the double treatment process it is necessary to refer once again to Figs. 1 and 2. It will be recalled that each hypereutectic nodule is surrounded by a volume of metal containing no quasi-flake graphite, and that the graphite from this region has been deposited upon the already existing hypereutectic nodule. It appears that each hypereutectic nodule has a sphere of influence within which further graphitization takes place by deposition on the hypereutectic nodule and outside which quasi-flake graphite forms. It follows, therefore, that if the number of hypereutectic nodules or nuclei could be increased so that their spheres of influence overlap, all the graphite will occur in the nodular form. That this is so has been proved[3,4] by the centrifugal casting of cerium-treated hypereutectic irons which, due to the low relative density of graphite and the action of the centrifugal force, causes a segregation of hypereutectic graphite nodules at the inner surface of the casting. The addition of the graphitizing inoculant in the double treatment process has the effect of increasing the number of hypereutectic nodules. Suitable graphitizing inoculants for this purpose are the 80 per cent grade of ferrosilicon, S.M.Z. (a proprietary alloy containing about 63 per cent Si, 6 per cent Mn, 6 per cent Zr and 20 per cent Fe) or calcium silicide, but the first two are to be preferred to

(*Continued on page* 176)

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(*Continued from page* 174)

the latter.

Table II gives the analysis and mechanical properties of the two nodular cast irons in the form of 1.2-in. bars in greensand—No. 1 produced by the single treatment process and No. 2 by the double treatment process. In both cases the melt was treated with 0.14 per cent cerium, but in the case of the double-treated iron 0.2 per cent silicon was added as 80 per cent ferrosilicon before casting.

The quasi-flake graphite structure of the single-treated bar No. 1 is shown in Fig. 3, and the almost entirely nodular structure of bar No. 2 in Fig. 4. The improvement in mechanical properties arising from the double treatment is clearly shown by the transverse, tensile and impact figures given in Table II. These are more or less typical figures, although much higher figures have been obtained, for instance for impact strength, and many other examples have already been given in the literature.[3,4]

Method of Adding Cerium—Cerium is a pyrophoric metal well known as an important constituent in lighter flints. The pure metal can be added to molten cast iron, in which it will dissolve easily and quickly without any violent reaction, provided it is not allowed to float on the surface, under which condition some loss by oxidation may result. Pure cerium metal is, however, a very expensive material, and it is more convenient and cheaper to add the element in the form off "*mischmetall*" which is commercially available. *Mischmetall* usually contains 45 to 55 per cent cerium, the balance being largely a mixture of the other rare earth elements which, for the purpose of the production of nodular irons, may be ignored. *Mischmetall* also dissolves easily in cast iron, and in all the remaining cases given in this paper it has been used as the cerium addition.

Having now described very briefly the essential features for the process for the production of nodular cast irons, it is possible to make a detailed survey of the mechanical properties of typical examples of the material. Nodular cast irons must be regarded as new materials having mechanical and physical properties differing in many ways from those of high-duty gray cast irons on the one hand, and malleable cast irons on the other. In spite of the nodular graphite structure, nodular irons are still relatively brittle and nonductile materials, and while, for instance, they have a shock-resistance inferior to that of the best grades of malleable iron, they are much less brittle than gray irons containing the usual flake graphite structures. The development and application of a new material of this type entails the determination of a wide range of mechanical properties other than those usually reported, such as transverse rupture stress, tensile strength, hardness, etc. The designer is interested, for instance, in the fatigue, damping and elastic properties of the material and, while the metallurgical aspects of the process have been dealt with in some detail already[3,4] in the literature, no attempt has yet been made to present a detailed survey of the special mechanical properties. An attempt to do this will be made in this section of this paper, but it is realized that the results given represent only a very rough preliminary outline of all the information required.

The test-bars used for the determination of most of the properties reported in this section were cast from five oil-fired crucible furnace melts. In two cases single-treatment material, and in the remaining three cases double-treated material, was cast. For the cerium addition, *mischmetall* was used in each case and S.M.Z. alloy was used as the graphitizing inoculant in the case of the double-treated material. For these melts three sand-cast pigirons were used of the following percentage compositions:

	Pig Iron A	Pig Iron B	Pig Iron C
T.C	3.94	4.05	3.99
Si	2.78	2.58	1.95
Mn	0.57	0.96	0.88
S	0.017	0.011	0.028
P	0.029	0.038	0.048
Ti	....	0.08	0.12
V	....	0.01	0.02
Cr	....	0.02	0.02

A number of 1.6, 1.2, 0.875, and 0.6-in. diam bars, and a number of special torsion bars, were cast from each melt. The standard transverse bars were all cast in greensand and top run.

The key to the numbering of the melts, the pigirons used, the additions used, and the chemical analyses are given in Table III. The first material, V.835, was white in the 0.875-in. and 0.6-in. bars, and the second, V.980, with a smaller *mischmetall* addition, was white only in the 0.6-in. diam bar. Both of these melts were single-treated and had microstructures consisting of quasi-flake graphite and a few hypereutectic graphite nodules in a matrix of about 60 per cent ferrite and 40 per cent pearlite in the case of the 1.2-in. bars. The structures of typical 1.2-in. bars of these two single-treated materials are illustrated in Figs. 5 and 6. Material V.895 was double-treated and had a well developed nodular graphite structure in a mixed pearlitic and ferritic matrix. The microstructures of the 1.6, 1.2, 0.875, and 0.6-in. bars of this

(*Continued on page* 178)

AWARD WINNERS: Hamilton Foundry & Machine Co., Hamilton ,O., held its fourth annual service award dinner Sept. 13. Special honor was paid to four newcomers to the 25-year-service table who were awarded service pins and engraved gold watches by Peter E. Rentschler, company president. Award winners shown above, left to right, are: Joe Campos, table blast operator; Fred Heffron, molder; Mr. Rentschler; Clem Henry, foreman of cleaning department, and Miss Mary Weiss, secretary

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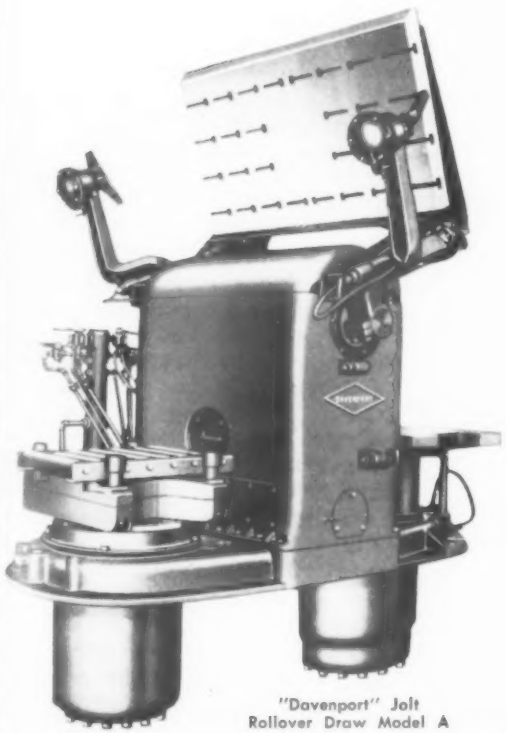

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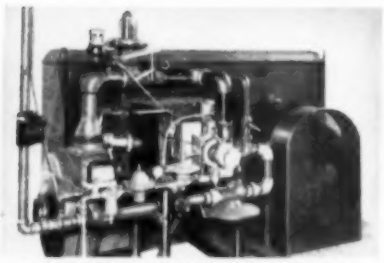

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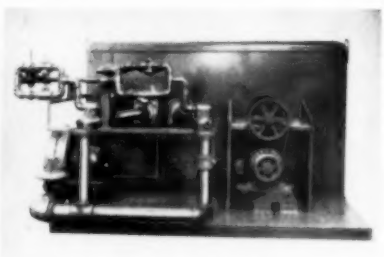

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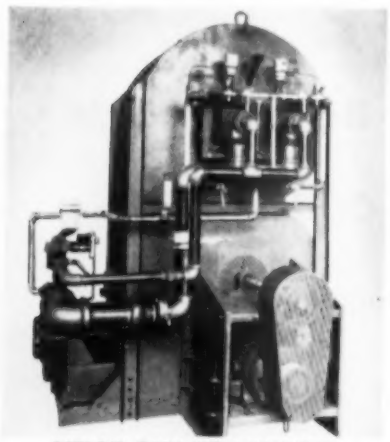

DETROIT GREY IRON FOUNDRY
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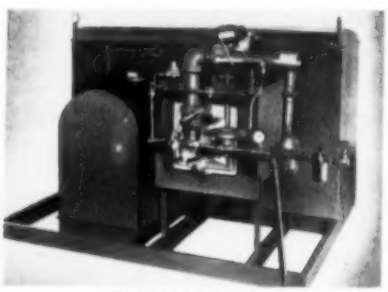

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(*Continued from page* 176)

double-treated melt, V.895, are illustrated in Figs. 7, 8, 9, and 10 respectively. The materials W.3 and W.30 were both double-treated nodular irons of lower silicon content to which 2.0 and 1.5 per cent copper respectively had been added. The microstructures of typical 1.2-in. bars from W.3 and W.30 are illustrated in Figs. 11 and 12 respectively. There was some quasi-flake graphite in W.3, particularly in the 1.6-in. and 1.2-in. bars, but W.30 was almost entirely nodular in all sections. The matrices of both these irons were almost entirely pearlitic, the amount of ferrite decreasing with decreasing section size.

The mechanical test results, covering transverse on as-cast and machined bars, and tensile, brinell hardness, impact and compression tests on each size of bar, are given in Table IV. The torsional properties, damping capacity, electrical resistivity and coefficient of thermal expansion results are summarized in Table V. The fatigue results are presented in Tables VII and VIII.

Compare Nodular and Flake Graphite

At appropriate points, the properties of the nodular irons will be compared with those of flake-graphite irons, of which details will be given in each particular context.

The transverse bars were tested on standard spans in the as-cast condition and after skin machining. A permanent-set and deflection test was carried out on a separate bar of each diameter. In such a test a small load is applied to the bar, and the dial gage which is used to measure deflections is set to zero. An increment of load is applied and the total deflection measured. This load is then removed until only the original nominal load remains. The deflection which remains represents the permanent set in the bar, and the difference between this and the total is the elastic deflection. This cycle of loading and unloading is repeated at successively increasing loads up to fracture, and from the measurements made a graph of total, permanent, and elastic deflection may be drawn, *e.g.*, Fig. 13.

A value for the modulus of elasticity is derived from the slope of the elastic line, which is a straight line drawn through the points representing the elastic deflection at the lower stresses. It is generally found that at loads near the breaking load the elastic deflection points lie a little to the right of the elastic line. This is true of flake and nodular graphite

(*Continued on page* 180)

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(*Continued from page* 178)

cast irons. The transverse results are given in Table IV and typical set and deflection graphs of a single and a double-treated nodular iron are illustrated in Figs. 13 and 14 for materials V.835 and V.895 respectively.

On the single-treated material the transverse rupture stresses varied from 40 tons per sq in. on a 1.6-in. diam bar to 64 tons per sq in. on a 0.875-in. diam bar. The strengths were considerably higher in the double-treated material V.895 and were higher still in the almost pearlitic materials containing copper. Transverse stresses of over 80 tons per sq in. were recorded on the bars W.30. The strengths of the machined bars were generally similar to those of the as-cast bars.

Show High Deflection

The notable features of the transverse tests were the very high deflections, the 1.2-in. diam bar V.895 deflecting over an inch before ultimate fracture. As is shown in Figs. 13 and 14, the high deflections in these nodular cast irons are due to considerable plastic distortion at the higher loads. At low loads the plastic and elastic deflections are less than for a high-duty flake graphite iron such as that shown in Fig. 15. This flake graphite iron, No. W.172, had the following chemical composition: T.C, 3.04; Si, 1.92; Mn, 0.84; S, 0.032; and P, 0.041 per cent. It was an inoculated, all-pearlitic iron with medium-sized flake graphite and on a standard 1.2-in. bar had the following mechanical properties: Transverse rupture stress, 44.9 tons per sq in.; deflection, 0.43 in.; modulus of elasticity (in transverse), 15.8×10^6 psi; tensile strength, 21.7 tons per sq in.; and modulus of elasticity (in tensile), 14.2×10^6 psi.

The low elastic deflections on nodular irons give high moduli of between 18 and 26 $\times$ 10^6 psi, compared with an average figure of about 16 to 18 $\times$ 10^6 psi for a high strength flake graphite acicular cast iron. Superimposed on the permanent set and deflection graphs of the flake graphite iron W.172, Fig. 15, are the plastic curves of nodular irons V.835 and V.895.

Tensile—Screw-ended tensile test-bars of diameters 1.128, 0.798, 0.564 and 0.399 in. were machined from the broken halves of transverse bars and broken in a hydraulic machine having specimen holders with spherical seats, thereby providing some degree of axial alignment. Set and extension tests were carried out in a manner similar to the set and deflection tests

(*Continued on page* 182)

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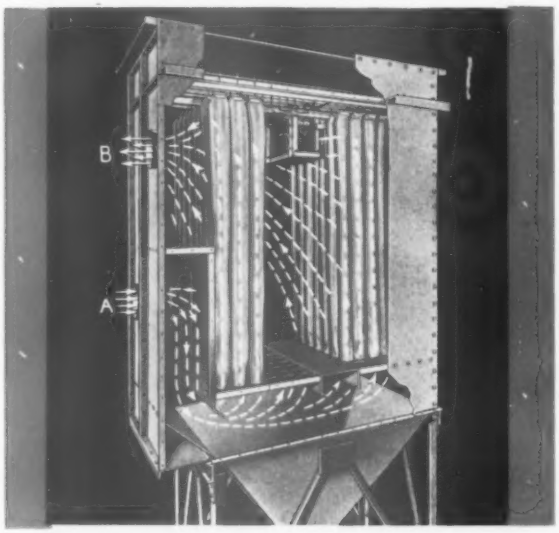

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(*Continued from page* 180)

in transverse, the specimens being repeatedly loaded and unloaded at successively increasing loads in order to divide the total strain into a plastic and an elastic component. To avoid breaking a test-piece with the extensometer still attached, the stress/strain curves were determined only to about 50 to 60 per cent of the ultimate tensile strength as estimated from duplicate tests. The tensile results are given in Table IV and permanent set and extension graphs for a single-treated, a copper-containing double-treated nodular iron and the high duty flake-graphite iron, for comparison, are illustrated in Figs. 16, 17 and 18, for materials V.835, W.30 and W.172 respectively.

Increase Tensile Strength

The tensile strength on the single-treated materials V.835 and V.980 increased from about 23 tons per sq in. on the 1.6-in. diameter bars to 25.5 tons per sq in. on the 0.875-in. diameter bars, all having moduli of elasticity of about 20×10^6 psi. The unalloyed, double-treated iron, V.895, increased from 28.8 to 34.8 tons per sq in. tensile with decreasing test-bar diameter from 1.6 to 0.6 in., and the strength of the copper-containing double-treated irons W.3 and W.30 were all in the 34.2 to 38.6 tons per sq in. range with correspondingly high moduli of elasticity up to 24.4×10^6 psi. A very much greater total extension occurs at the breaking load in nodular irons than in flake graphite irons, but there is no yield stress or necking such as that observed in testing blackheart and whiteheart malleable irons. Total extensions on a 2-in. gage length for as-cast nodular irons do not usually exceed 3 per cent but as high as 5.5 per cent has been recorded. Some further extension figures are given later in this paper in the section dealing with heat-treatment.

As in the case of transverse tests, the large amount of strain takes place at the higher stresses and, at the lower stresses, the total and plastic strains are lower than for flake graphite cast irons. This is illustrated in Fig. 18. The ratio of transverse to tensile stress varied from 1.7 to 2.5.

Hardness — Brinell hardness tests were carried out with a 3,000 kg. load, 10 mm. ball, or 750 kg. load, 5 mm. ball, on disks cut from the bars. The 3,000 kg. load was used on the 1.6 and 1.2 diameter bars. The average brinell hardness numbers are given in Table IV. The brinell hardness numbers of nodular cast irons

(*Continued on page* 184)

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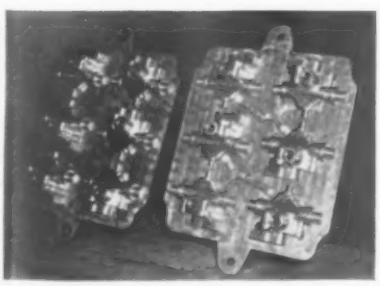

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(*Continued from page* 182)

tend to be slightly higher than of untreated material of otherwise similar analysis.

Impact — The impact test results reported in Table IV were carried out on plain cylindrical test-pieces 0.798 in. diam in an Izod impact machine in accordance with B.S.S. 1349. All impact test-pieces were machined axially from broken transverse bars of the three larger sizes. Each impact figure in Table IV represented one test on a 3-in. long test-piece. The symbol >120 implies that the test-piece withstood the full 120 ft lb impact of the hammer without failure. The average impact strength for a low phosphorus pearlitic flake graphite cast iron in this test would be about 20 ft lb and for a high-duty acicular cast iron 30-40 ft lb. A good quality flake graphite austenitic iron would withstand 120 ft lb without failure.

The impact results obtained are very erratic, but they do show the order of shock-resistance of nodular irons. The impact strength is raised by double-treating and in the 0.875-in. diam bars from V.895 and W.3, two of the specimens were unbroken by the 120 ft lb blow. The lowest impact figure obtained, 32 ft lb on V.835, is as high as most high-duty acicular irons.

The high shock-resistance is one of the most important properties of nodular iron, but it is still brittle compared with malleable irons and steels. To illustrate this, a piece of 0.875-in. diam bar, V.895, which had given impact strengths on the 0.798-in. diam bar of over 100 ft lb was machined to 0.45-in. diam and broken in the grips used for testing steels in accordance with B.S.S. 131. A plain and a notched test-piece gave impact strengths of 4.0 and 0.5 ft lb respectively.

Compresion — Compression specimens 0.564-in. diam and 1⅛ in. long were machined from midway between the axis and the surface of each transverse bar. They were compressed between platens on the testing machine, the movement of the straining head being measured by means of a dial gage. Although the dial readings were not an accurate interpretation of the straining of the specimen, they did give a qualitative indication. Fig. 22 illustrates a load/compression curve obtained in this way for material V.895. At about half the breaking load an appreciable shearing of the test-pieces took place and this continued until, after considerable strain, failure occurred due to shearing in a plane at about 40°

to the axis. A compression test-piece from V.980 is illustrated in Fig. 20, after plastic straining and after fracture.

The compression strengths obtained on specimens from each size of bar of the five nodular irons are given in Table IV. The strengths are between two and three times the tensile strength, whereas on flake graphite irons the ratio is generally three to four, but it must be remembered that in the nodular-iron tests there was considerable shearing over of the test-piece. The construction of the machine offered little resistance to such shearing action.

Separate Component Parts

From a 1.2-in. diam bar of each material, a headed compression specimen was machined with a 0.564-in. diam gage length 2¼ in. long and with heads 1.1 in. diam and faces parallel with each other. To the gage length was attached an extensometer which recorded the reduction in length due to compressional stress. On each specimen a test was carried out, on the same lines as a set and extension test in tension, to separate the total compressional strain into its component parts. A test was discontinued when visible shearing or buckling took place. A typical graph, obtained on material V.835, is illustrated in Fig. 23 and the moduli of elasticity obtained from these tests are given in Table IV. The moduli of elasticity in compression are very similar to the moduli in tension.

A specimen was cut from a fractured test-piece from V.895 and examined microscopically in the direction of shearing strain. Figs. 20 and 21 illustrate the general microstructure and the distortion of a graphite nodule respectively. They show that both the ferritic and pearlitic constituents and the graphite nodules are capable of appreciable plastic distortion without rupture.

Torsion—From each nodular-iron melt were cast a number of shaped torsion bars 1¼ in. diam along an 8-in. length, with large heads at each end to fit the grips of the torsion machine. The cast bars were machined to the dimensions given in Fig. 24 and keyways were cut in the heads. The bars were tested in a 15,000 lb in. reversed torsional machine and the torque was applied through keys fitting both straining head and test-bar.

One test-piece of each material was loaded continuously to fracture, the angle of twist being recorded for each 500 lb in. increment of torque.

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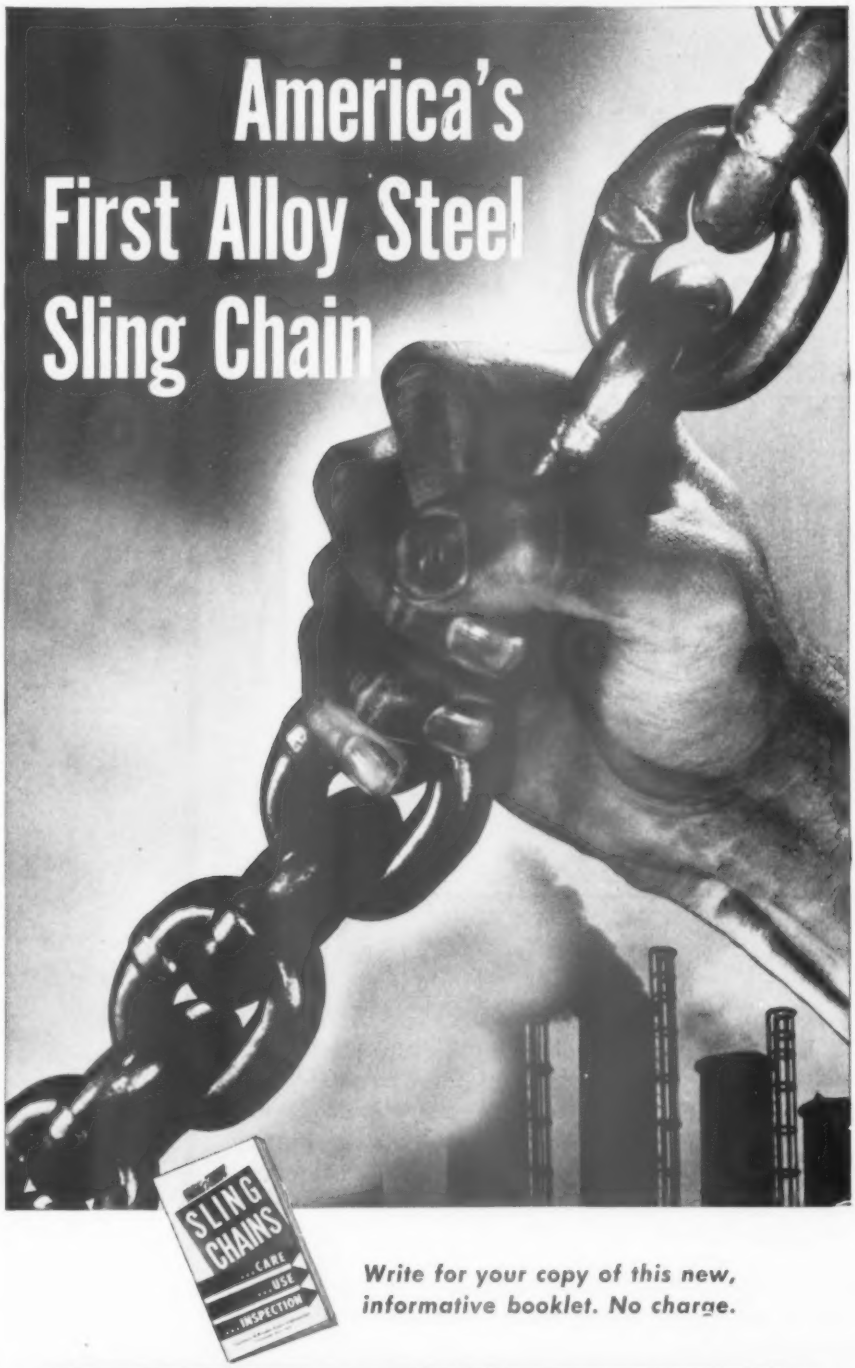

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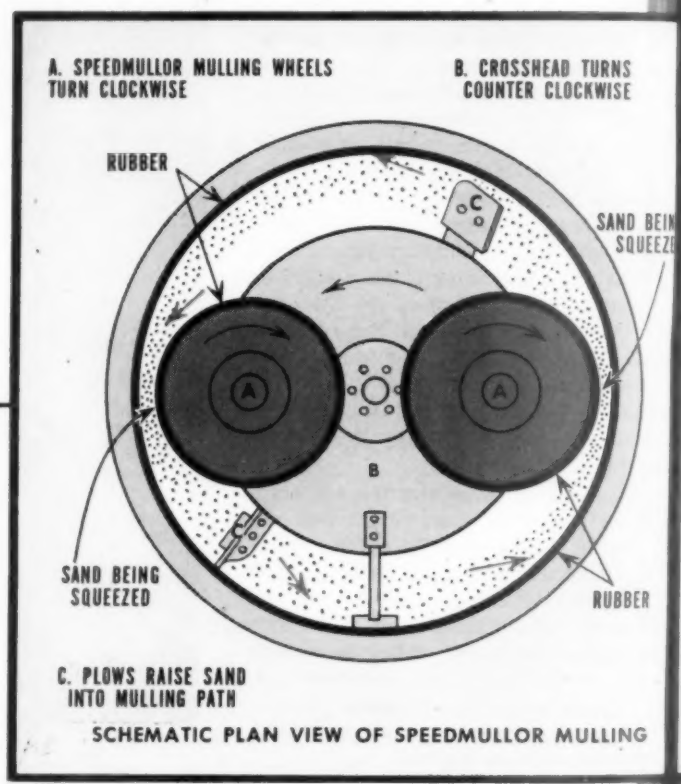

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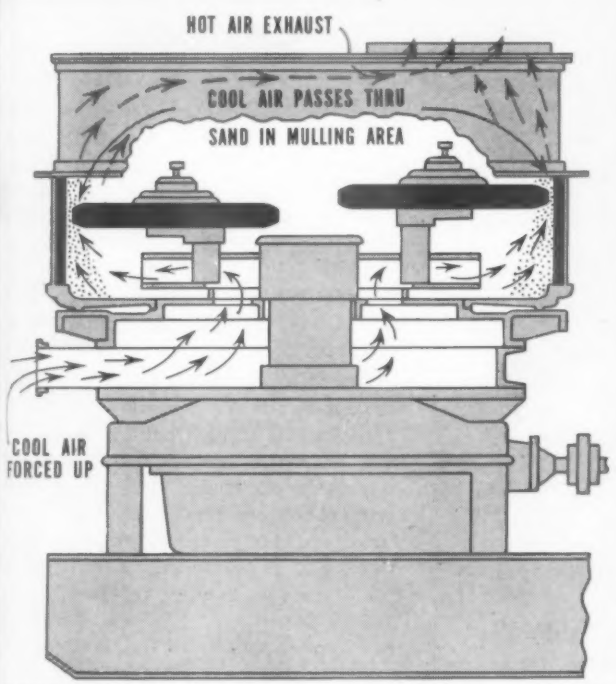

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(*Concluded from page* 185)

The second bar was tested to split up the total twist curve into its integral part in the same manner as the set and extension curve in tension, and the third bar was subjected to a cycle of loading to equal magnitude of stress in both a positive and negative direction, thereby giving a hysteresis loop. The ultimate torsional shear stresses and the moduli of rigidity are given in Table V and permanent set and twist, typical load/twist, and hysteresis curves are illustrated in Figs. 25, 26 and 27 respectively.

The ultimate torsional stresses were very close to the ultimate tensile stresses. The test-pieces all broke with helical fractures characteristic of brittle materials, and the total twist on the 8-in. length was usually about 90 deg., the equivalent of 10 per cent strain. The V.980 bar twisted 180 deg. before fracturing. There was a point in the torque/twist curves (see, for instance, Fig. 26) usually at about 50 to 60 per cent of the breaking torque, after which the rate of strain for each increment of torque increased rapidly. In this respect the shape of the curve resembles the compression curve, Fig. 22.

For the limited stress-range that the set and twist tests cover, the curves are again very similar to the set and deflection curves in transverse (Figs. 13 and 14) and the corresponding curves in tension (Figs. 16 and 17). The elastic points, derived by subtracting the plastic from the total twist, likewise curve toward the total twist line as the stress increases. The moduli of rigidity, C, calculated from the slope of the elastic lines, vary between 8.2 and 9.7 $\times$ 10^6 psi and are related approximately to the moduli of elasticity in tension by the expression:

$$\frac{\text{Modulus of Elasticity (Tension)}}{\text{Modulus of Rigidity (Torsion)}} = 2.5$$

The points O. A, B, C, D, E, F, G, H, Fig. 27, are on the cycle of loading, unloading and reversal of load for material V.895. At 4,000 lb in. torque during the initial loading, the torque was removed and the narrow loop AB, BA was obtained. After about 6,000 lb in. the slope of the curve decreases, as OC, in the same manner as the torque/twist test on the first bar. Upon unloading a permanent set OD remained. The bar was loaded in the reverse direction, DE, to the same magnitude of stress and unloaded, EF, to zero stress. Upon reloading, FG, the initial positive strain was nearly reached and from there on it behaved similarly to the previous cycle. At these higher stresses a certain amount of creep takes place so that, depending upon the rate of testing, the point G might easily be on the right-hand side of C. It is apparent from such a hysteresis loop as Fig. 27 that once the material has been plastically strained, the stress/strain relationship varies according to the position in the cycle. In this respect the nodular irons behave in the same manner as the flake graphite irons and differ only in degree.

(*To be concluded next month*)

TABLE V.—Further Properties of the Irons of Table IV

Melt No.	Torsion: Ultimate Torsional Shear Stress, Tons/sq in.	Torsion: Modulus of rigidity $\times 10^6$, psi	Damping Capacity: 1 Ton per sq in.	Damping Capacity: 5 Tons per sq in.	Damping Capacity: 9 Tons per sq in.	Electrical Resistivity Microhms per cu cm.	Coefficient of thermal expansion per deg. C., 15° C.–100° C.
V.835	24.8	8.3	1.7	5.4	11.0	62.6	10.6×10^{-6}
V.980	26.1	8.2	2.0	4.9	9.2	62.6	10.3×10^{-6}
V.895	31.8	9.6	1.0	3.0	5.3	66.9	10.5×10^{-6}
W.3	37.5	9.2	0.8	2.8	4.9	59.1	10.6×10^{-6}
W.30	>40	9.7	0.6	2.7	4.3	60.6	10.3×10^{-6}

TABLE VI.—Composition of Three Nodular Irons

Melt No.	Treatment and Additions	T.C. Per cent.	Si. Per cent.	Mn. Per cent.	S. Per cent.	P. Per cent.	Ce. Per cent.	Ni. Per cent.	Mo. Per cent.	Remarks.
NOD.67	Single. 42 gm. *mischmetall* to 60 lb. tap	3.85	2.69	0.49	0.012	0.028	0.029	...	...	Quasi-flake graphite.
W.7	Double. 65 gm. *mischmetall* to 80 lb. tap 9 oz. S.M.Z.	3.56	2.82	0.81	0.012	0.035	0.034	...	...	Nodular graphite.
V.636	8 oz. FeSi (80 per cent.) to 80 lb. tap	2.91	2.16	0.64	0.025	0.028	....	1.92	1.18	Flake graphite. Acicular.

TABLE VII.—Fatigue Tests of the Irons Detailed in Table VI

Melt No.	Tensile Tons/sq. in.	Fatigue Limit.	Endurance Ratio, (Tensile) / (Fatigue)	Structure.
V.980	25.4	15.0	0.59	Quasi-flake, ferrite and pearlite.
V.895	35.2	16.0	0.46	Nodular, ferrite and pearlite.
W.3	38.2	18.5	0.48	Nodular, pearlite.
NOD.67	24.1	12.0	0.50	Quasi-flake, ferrite and pearlite.
W.7	30.5	17.5	0.57	Nodular.
V.636	33.9	11.5	0.34	Flake, acicular.

TABLE VIII.—Fatigue Strength of Plain, Grooved and Notched Bars

	NOD.67. Plain	Nodular 0.05-in. Groove	Nodular 45-deg. Notch	V.636 Plain	Flake Acicular. 0.05-in. Groove	Flake Acicular. 45-deg. Notch
Tensile, tons/sq. in.	24.1	26.4	25.9	33.9	30.6	26.4
Fatigue limit, tons/sq. in.	12.0	8.5	7.0	11.5	8.5	9.0
Endurance ratio, $\frac{\text{Fatigue}}{\text{Tensile (plain)}}$	0.50	0.35	0.29	0.34	0.27	0.25
Endurance ratio, $\frac{\text{Fatigue}}{\text{Tensile (notched)}}$	....	0.32	0.27	....	0.29	0.32
Static stress concentration factor, $\frac{\text{Tensile (plain)}}{\text{Tensile (notched)}}$	1.0	0.91	0.93	1.0	1.11	1.28
Dynamic stress concentration factor, $\frac{\text{Fatigue (plain)}}{\text{Fatigue (notched)}}$	1.0	1.41	1.72	1.0	1.28	1.35

ALUMINUM ALLOY CASTINGS

(*Continued from page* 89)

ing to reduce metal agitation, the use of higher mold permeability, and maintenance of the volatile molding constituents at a low level. In addition, several materials are available which may be sprayed on the cope surfaces of the mold to reduce the tenacity of the metal surface film and thus allow the gas to escape more readily.

Shrinkage—Failure to compensate adequately for the decrease in volume of the metal during solidification results in shrinkage voids. The more commonly occurring defects of this type, which are readily visible to the naked eye, are called "shrinkage cavities," and a scattering of extremely small voids is usually referred to as "micro shrinkage." When voids of this type appear on the surface of a casting they are usually classed as "surface shrinkage." If shrinkage is severe, one or more sections of the casting may be so weakened that "shrinkage cracks" occur.

The presence of shrinkage cavities or microshrinkage indicates either a lack of proper feeding or lack of progressive solidification. The usual remedies are improved feeding by the use of additional risers, a suitable combination of chills and risers, or changes in the gating so as to supply cooler metal to the sections where the shrinkage occurred. Surface shrinkage generally indicates a high pouring temperature, especially when it is accompanied by relatively large grain size. Changes in the gating system often will permit the metal to be poured at a lower tem-

perature. Surface shrinkage may also be caused by hard ramming, which lowers the mold permeability, or by core shifts, which result in uneven wall thickness and thus affect the rate of solidification.

Gas Porosity — Evolution of dissolved gas, usually hydrogen, during solidification results in gas porosity, sometimes called "pinhole porosity." It consists of small round or angular voids distributed throughout the casting and is usually revealed only on machined surfaces, in fractures, or by x-ray examination. In general, gas porosity is more severe the higher the pouring temperature and the lower the rate of solidification.

Good metal-handling practices and thorough degassing will minimize the gas content of the metal when poured. The use of chills to accelerate the rate of solidification of heavy sections and the proper design and placement of risers also are helpful. Where gas porosity is caused by gas absorbed in the mold cavity, it can be reduced by the use of a more permeable sand, lighter ramming, and lower moisture content in the sand.

Cracks—Aluminum alloys have low strength in the hot-short range, which is the temperature region just below the solidification temperature range. Consequently, excessive restriction of the casting during solidification and contraction may produce stresses high enough to cause cracks to occur as the metal passes through the hot-short range. If the cracks occur before solidification is complete, they may be filled with eutectic liquid, in which case they are called "liquidation cracks."

Cracking may be minimized by eliminating, insofar as possible, potential sources of resistance to contraction and by strengthening sections subject to cracking. Specific corrective measures include: use of strengthening ribs, fillets, or fins; changing the chilling, gating and risering to reduce the possibility of hot spots; and the use of cores having greater collapsibility. Placing wedges in the sand adjacent to risers, which are removed after pouring to lessen the resistance to contraction, sometimes is the simplest solution.

Misruns and Coldshuts—These discontinuities are both related to fluidity, or ability of the metal to fill the mold cavity. Both are thus closely related to pouring temperature. A misrun is failure of the molten metal to fill the mold cavity completely. A coldshut is a seam-like discontinuity that forms when two streams of metal from different directions join in the mold cavity but lack sufficient

draw the mold

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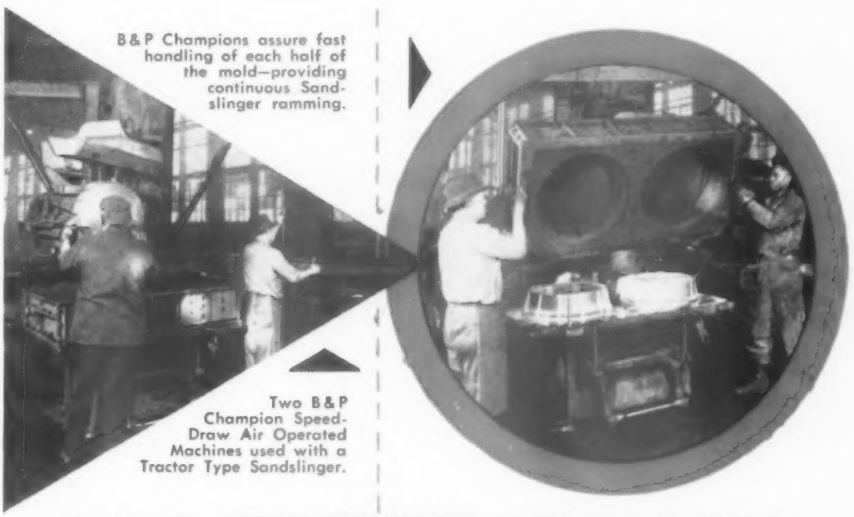

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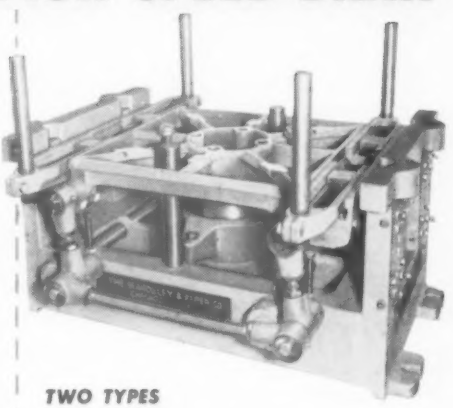

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fluidity to form an intimate metallic bond through the intervening oxide films. Fluidity is increased by increasing the pouring temperature, but too high a pouring temperature may result in other difficulties, as already discussed. Alteration of the gating system to provide easier entry of the molten metal into the mold cavity often will prove an effective remedy for both these difficulties. Some alloys, notably those containing silicon, have higher fluidity than others, and therefore in particularly troublesome cases it may be found most desirable to change to an alloy having higher fluidity.

Segregation — A small amount of segregation of some of the alloying constituents normally is expected in cast materials. Too high a degree of segregation, however, may impair the mechanical characteristics of the castings and result in non-uniformity of casting quality. In some cases segregation occurs in the melting or holding furnace, and the remedy for this obviously is better control of those processes. Where troublesome segregation occurs in the mold, correction usually can be made by modifying the gating and chilling to improve solidification conditions.

Mechanical and Chemical Tests — Standard mechanical and chemical tests should be made periodically to assure that the completed castings will possess the required mechanical strength and will conform to specifications for chemical composition. Specifications and test methods formulated and standardized by the American Society for Testing Materials[1, 2] are most commonly used.

ASTM specifications for tensile tests stipulate that for sand castings[2] specimens shall be separately cast in green sand and shall be cast to size as follows: gage length, at least 2¼ in.; gage section diameter, ½ ±0.010 in.; radius of fillet between gage section and ends of specimen, not less than ½ in. In order to promote breakage in the center, it is permissible to use a taper in the reduced section from fillets to center of not to exceed 0.010-in. Specifications for permanent mold test specimens[3] are similar except for the obvious stipulation that the specimens shall be separately cast in a permanent mold and that the gage section diameter shall be 0.505±0.010 in.

If the castings are to be heat treated, the test specimens representing such castings shall be heat treated with the castings they represent. They shall not be machined prior to test except to adapt the grip ends of the specimen to the jaws of the testing machine in such a manner as to assure axial loading. Test specimens are cast to represent each unit of 1000 pounds, or fraction thereof, of clean castings. If tests on heat treated specimens do not conform to the applicable specifications, the castings may be reheat treated, but not more than twice.

In regard to sampling for chemical analysis, the ASTM specifications[2, 3] stipulate that the samples also shall be selected insofar as possible by heats or melts, or groups of heats or melts. Samples shall be taken by "sawing, drilling, or milling the casting or test specimen in such a manner as to be representative of the material." The tool used in taking the sample shall be thoroughly cleaned; no lubricant shall be used in the operation; and the sawings or metal chips shall be carefully treated with a magnet to remove any particles of iron introduced in taking the sample.

Tests other than these routine tensile and chemical tests are usually left to the customer, as are any special tests to determine the abilities of the castings to meet special requirements. Some of the larger foundries, however, are equipped to perform a complete range of mechanical tests, including hardness, compression, shear, fatigue, and impact tests, and many special tests as well.

In evaluating tests made on test specimens, it must be realized that the results are not directly applicable to the castings; also that the strength developed in different parts of a casting will vary. Different conditions within the mold and different rates of solidification in sections of different thickness will result in variations in mechanical properties. However, the tests on standard test specimens will provide a check on the composition and metal handling practices and, when heat treated with their corresponding castings, a check on the heat treatment conditions.

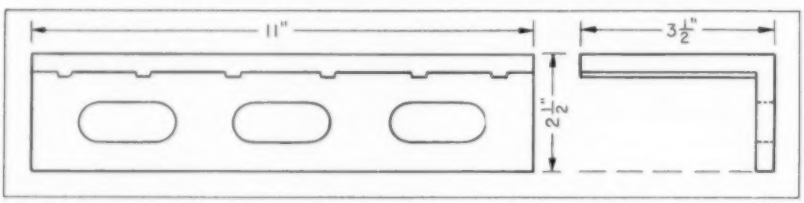
Foundry Records—Any treatise on quality control would not be complete without some mention of the importance of foundry records in maintaining uniformly good quality in the completed castings. Photographs or drawings should be provided for each casting produced showing the position of all gates, risers, chills, runners and any other appurtenances; these records should also be properly keyed to records of all other foundry practices related to each job.

Records of foundry operations should cover the weight and source of metal in each charge, significant temperatures maintained during various stages, method of fluxing, pouring temperature, rough weight, finish weight, percentage of scrap, and other pertinent details. Complete records of the condition of molding and core sands and results on all sand tests will prove of inestimable value in controlling any variations in quality that may arise from this particular cause.

The problem of keeping adequate records is simpler in permanent mold operations for the obvious reasons that no sand is involved (except sand cores in semipermanent mold work)

(*Continued on page* 192)

Sand Blast Straightens Warped Castings



By EARLE HOLMES

A TROUBLE shooting job involved a small gray iron casting, 11 in. long, approximately the shape of a piece of angle iron, 2½ in. wide on one member and 3½ in. wide on the other. The casting, 5/32-in. thick, had several small openings and over 60 small bosses on the four sides. When these castings were cleaned on a revolving sand blast table, about 20 out of every hundred were warped.

After a considerable amount of experimental work, a simple remedy was discovered. After one pass through the sand blast, the warped castings were turned over and passed through again. They came out perfectly straight and square. The pattern had only 1/32-in. finish allowance on a casting to be milled all over. It should have had 3/32-in. to prevent excessive wear on the milling cutters. This casting was on a steady production schedule that called for large numbers every day.

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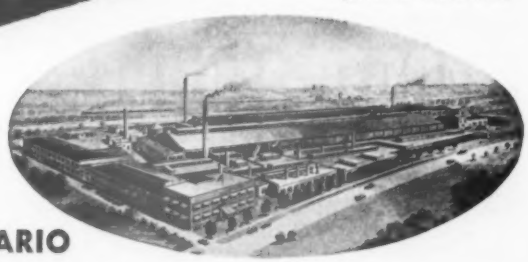

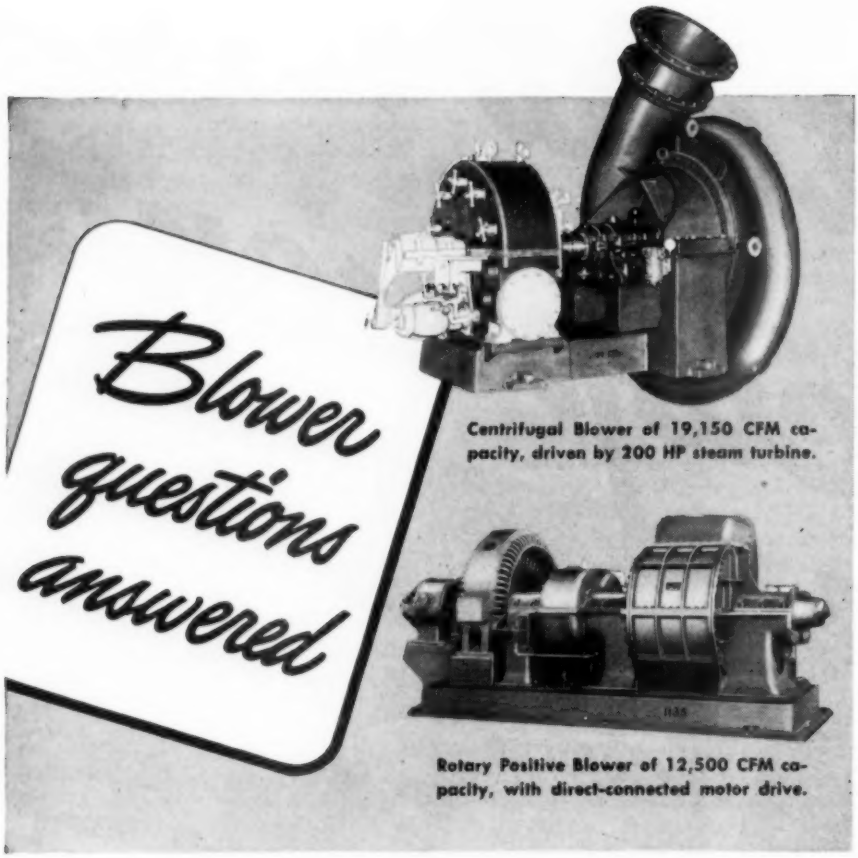
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(*Continued from page* 190)

and the arrangement of gates and risers is incorporated within the mold structure. Because the success of permanent mold operations is so dependent on accurate control of metal melting and handling procedures and mold conditions, however, complete records of these items are especially important in all permanent and semi-permanent mold work.

Adequate records of testing and salvage operations are especially important in maintaining quality. Foundries not equipped to perform all the desired tests on the finished castings would do well to request data on tests performed by consumers. Records of salvage operations are doubly useful as changes in technique dictated by rising salvage costs have the double advantages of improving the product and at the same time decreasing manufacturing cost.

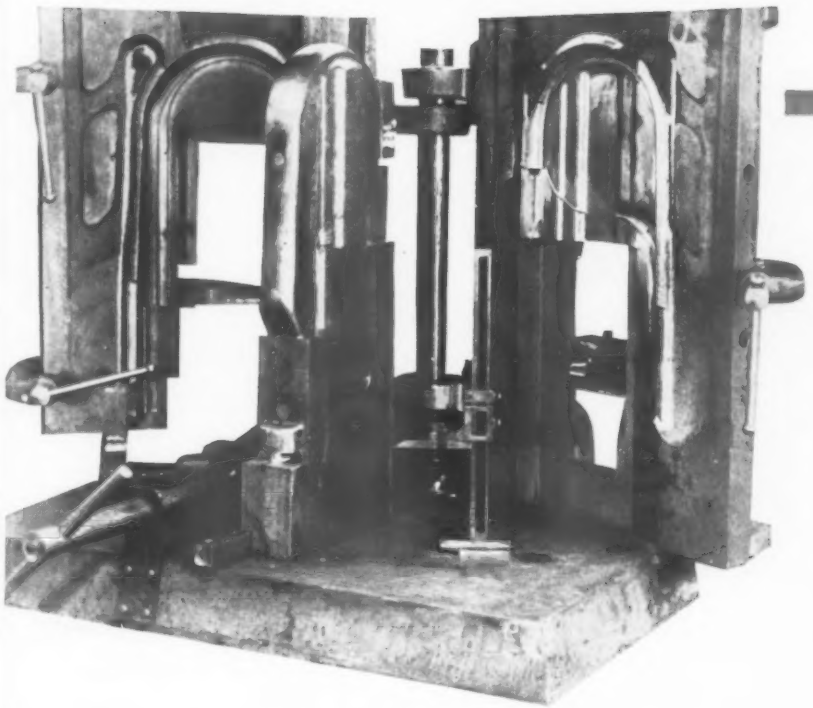
Conclusion — The inspection and quality control program is the tool by which the reliable foundry assures itself that only sound castings which meet the established specifications finally reach the customer. It is thus one of the most important tools in the foundryman's kit and well deserves his most careful consideration.

Foundrymen can be of great help to their customers in establishing quality standards appropriate to specific casting applications. It is their duty to set up economical inspection procedures that will assure the production of castings of adequate quality but to avoid costly programs where these are not justified. Good judgment based on sound experience is the best guide here as in so many other aspects of foundry work.

When properly executed, the four principal methods of salvage are normally accepted as comprising a part of the foundry processes. Even though tnese salvage methods are fully accepted, however, and castings to which they have been applied are considered to be fully satisfactory by the customer, the foundry should strive to produce superior quality castings at all times which will require a minimum amount of salvage.

As the inspection operation usually is the last to be performed by the foundry before shipping the finished castings to the customer, this article on inspection and quality-control procedures logically forms the conclusion of this 12-month series on sand and permanent mold aluminum foundry operations. Other articles in the series have covered the alloys available, melting and pouring proce-

(*Concluded on page* 194)



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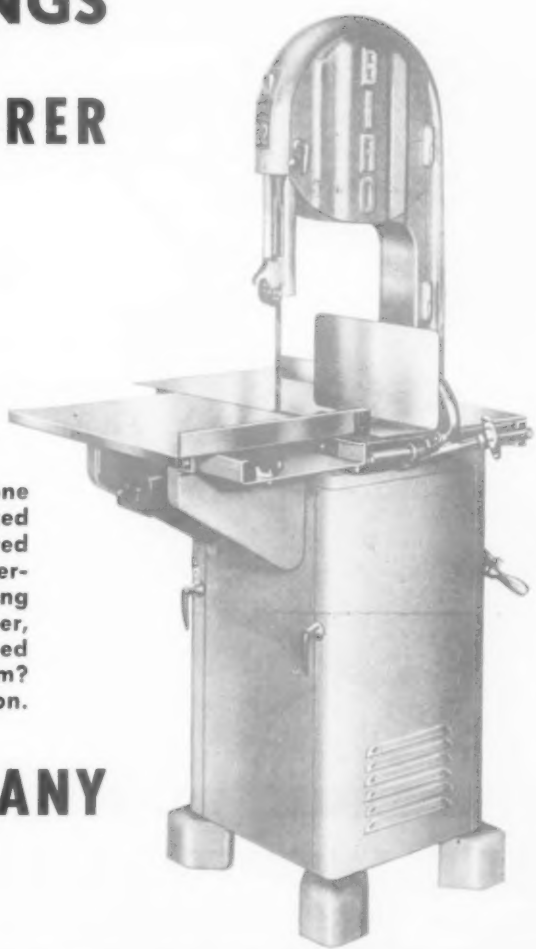

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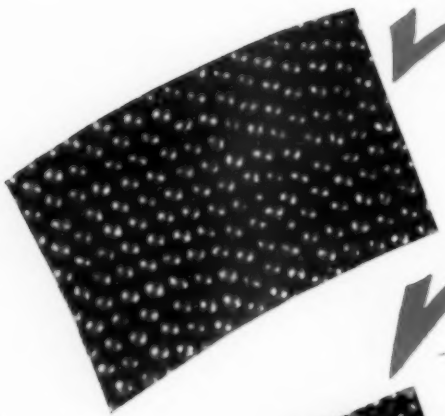

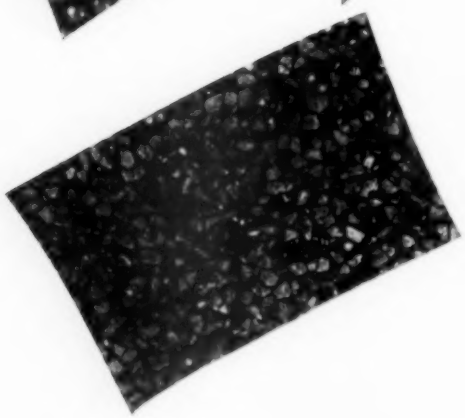

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(*Concluded from page* 192)

dures, casting design, sand molding, permanent mold practices, finishing operations, and heat treatment.

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National Malleable Honors Workers

Indianapolis works of National Malleable & Steel Castings Co., Cleveland, at the fifth annual meeting of its Naco Service Society, in Claypool Hotel, Indianapolis, on Oct. 8, paid tribute to workers with long service records. Presentation of certificates and pins was made by W. W. Flagle, manager of the Indianapolis works, and 43 who have completed 30 years with the company were awarded gold watches by Walton L. Woody, vice president. Henry Theis and John Workman were honored for records of more than 50 years. New members in the society numbered 53.

Munitions Advisory Board Elects Head

At the organizational meeting of the Munitions Board's Foundry Industry Advisory Committee, held in the Pentagon building, Washington, Sept. 29, Frank G. Steinebach, editor of THE FOUNDRY, was elected chairman.

Scope of the committee's coverage was discussed at length and subcommittees were appointed in charge of the following breakdowns: Gray iron castings, malleable castings, steel castings, brass and bronze castings, aluminum and magnesium castings, cast iron pipe, foundry technical, cast armorplate and foundry equipment and supplies.

Society for Experimental Stress Analysis, will hold its annual meeting at Hotel Commodore, New York, Dec. 2 to 4. Inquiries should be addressed to the society, P. O. Box 168, Cambridge 39, Mass.

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Fig. 1—Stockyard of Urick Foundry Co., Erie, Pa., is served by monorail crane which extends over railroad siding

Fig. 2—One-man pouring ladle incorporates push-button control for easy handling

Fig. 3—Pouring molds from both sides of roller conveyor line

Fig. 4—Castings from shakeout table at left rear are moved in pans over roller conveyor to the cleaning and finishing department

Fig. 5—Return conveyor lines of poured molds at left, with lines of molds to be poured at right

Efficient Handling IN A SMALL FOUNDRY

By WALTER RUDOLPH

EFFICIENCY in materials handling has been developed to a considerable degree by the Urick Foundry Co., Erie, Pa., a comparatively small jobbing producer of gray iron castings. During the period since 1937, when the company was established and acquired its present plant, an intensive modernization program was undertaken, with emphasis on improved handling of raw materials and products. Approximately 1000 different patterns are run monthly, and the plant is currently capable of producing about 800 tons of finished castings monthly, these ranging from a few pounds to approximately 4 tons in weight. Personnel numbers about 150 persons.

Mechanical handling starts in the neat and well arranged stockyard illustrated in Fig. 1. Pig iron, scrap and limestone are stored in concrete bins which are served by a 5-ton capacity monorail crane equipped for handling either a magnet or bucket. The monorail extends over a railroad siding adjacent to the bins to facilitate unloading from freight cars. With this arrangement one crane operator can unload a number of cars daily—formerly a job for a sizable yard crew. From the storage bins materials are moved into the plant by the yard crane and yard truck where they are weighed on floor scales, dumped into a buggy equipped with pneumatic tires, and then discharged into a cupola skip hoist.

Coke and sand are stored in enclosed bins adjacent to the railroad siding. Both materials are received in bottom-dump hopper cars which unload into pits beneath the tracks. Conveyor belts at the bottoms of the pits carry the coke and sand into the plant for storage. The coke conveyor dumps onto portable conveyor extensions of the system to drop the coke in whatever portion of the bin can take it.

Various types of core sand are stored in individual bins. To facilitate this, another monorail crane installed over the bins carries a 1¼-yd capacity dump bucket from the in-plant end of the sand conveyor over whichever bin is being loaded. Pushbutton controls permit the crane operator to shut off the conveyor leading from beneath the tracks when the bucket is ready for dumping into a bin. One man can unload 10 tons of sand per hr, a task which formerly required two men 15 hr to perform manually.

Another feature of the handling feature of the foundry yard is a small refuse building, incorporating a grated floor and housing for a conveyor. Workers haul refuse in wheelbarrows from the plant and dump it on this floor, through which it falls on to a belt conveyor and is lifted into trucks as required for removal from the premises.

Hot metal is obtained from a 48-in. diam cupola melting 8 tons per hr and located in the middle of one side of the 200 x 225-ft main bay of the plant. Only one base iron is melted to which alloy additions are made to produce irons to meet various mechanical property specifications. The iron is tapped into a mixing ladle from which it is poured into 1-ton transfer ladles. The latter carry the iron to 400-lb pouring ladles serving the small-castings bay. Transfer and other larger ladles are employed for pouring medium-size castings beyond the capacity of the 400-lb ladles, and for those up to 4 tons in weight. Pouring ladles are suspended from two floor-controlled traveling cranes which operate the length of the bay.

Pouring ladles, as shown in Figs. 2 and 3, are attached to a mechanism which provides the operator with pushbutton control over raising and lowering by means of a geared motor. A ladle is operated from both sides of each line and the molds are poured two up. Molds are poured off in the latter part of the afternoon, allowed to remain overnight, and shaken out next morning. Members of the shakeout crew move the molds over the conveyor to the end of the line where the shakeout is located, and with an air hoist lift them to the shakeout screen. Flasks are returned to the molding department over roller conveyors and castings are placed in tote pans or on trays for transfer

(*Concluded on page* 199)

4

5

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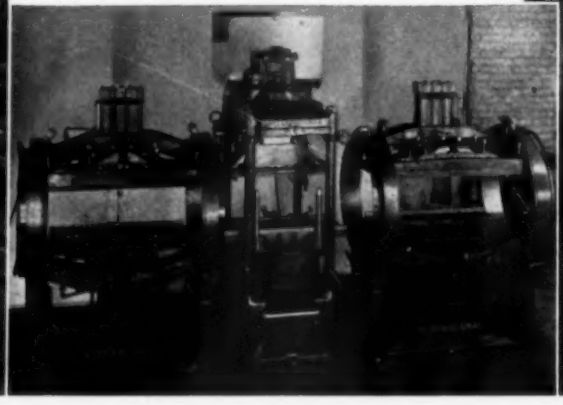

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by roller conveyor a short distance to the finishing department where shot blasting precedes grinding and other finishing operations. Gates and other scrap are thrown into a hopper and returned by power truck for recharging into the cupola.

Sand recovered at the shakeout screen is carried by belt conveyor which travels under the floor and upward to a screen. From the screen it passes over a magnetic pulley and discharges into a bucket in which the sand is elevated and dumped into the muller. Sand after mixing is discharged from the bottom of the muller onto a horizontal belt conveyor which carries it to an elevator. The elevator discharges the sand into an overhead aerator from which it then is distributed to hoppers over the molding machines.

Castings from the shakeout are first put through an airless blast table (Fig. 4) and are deposited in steel boxes for transfer to grinding and other finishing operations preparatory to inspection and shipment. Medium-size castings are molded on jolt, rollover and draw molding machines in another bay and set out on the floor for pouring. Largest castings are made in the center bay.

Urick Foundry Co. is growing and continually planning for plant improvement. Last year changes were made in heat treating facilities such as used for stress relieving heavy and special castings. With gas shortages crippling production at times, an oil heating system has been added as a stand-by for emergency use.

CASTING STEEL AND IRON ROLLS

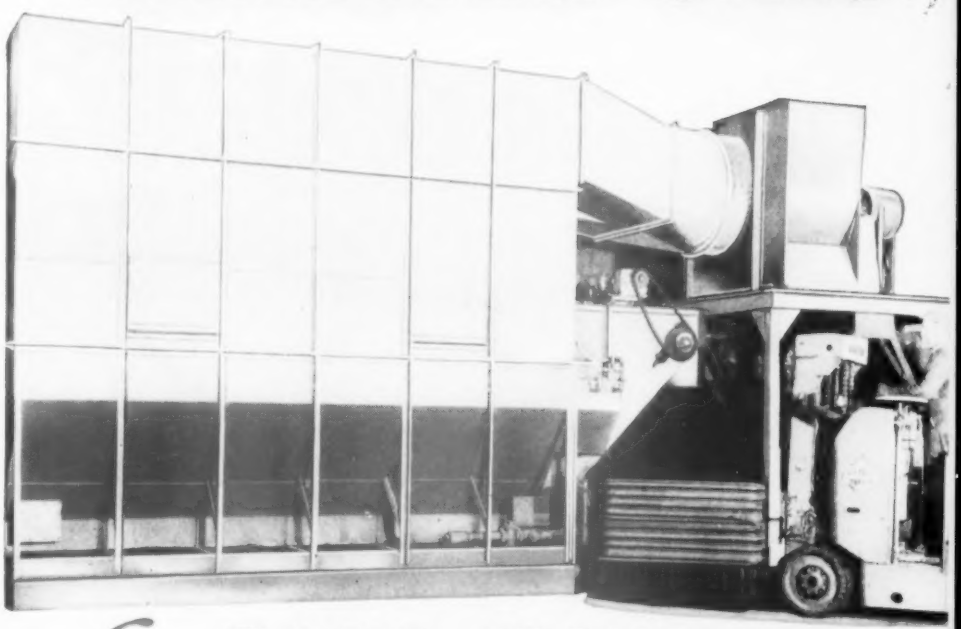
(*Continued from page 99*)

treatment. It is then ready for the final machining where the surface is ground to a mirror smoothness.

While similar in many respects, the technique of producing iron rolls differs from that employed in the steel foundry. The metal is melted in an air furnace. The charge usually consists of four varieties of pig iron and a certain amount of roll scrap, heads and necks from the machine shop, and worn-out rolls returned from customers. Exact weight and composition is marked on each component part of the charge. Usually the furnace is charged at night. The sand bottom of the furnace is covered with boards to prevent destruction by the heavy pieces of scrap. With the fire lighted at 7 a.m., the heat is ready to tap about noon.

Each time before going into service

Announcing
THE BEST INVESTMENT IN DIRT AND DUST CONTROL EQUIPMENT YOU CAN MAKE!
Schmieg NEW all *Stainless Steel* ARRESTER UNIT



for SAND HANDLING *and* SHAKEOUT

Because it is made of stainless steel and *because* it is designed and manufactured for longer, corrosion-free operation, the new Schmieg 30,000 C.F.M. Centri-Merge Swirl Type Arrester illustrated is the best buy on the market. Stainless steel is your guarantee of long-range low maintenance costs. A Schmieg unit is easily installed to occupy a minimum of valuable floor space for the most efficient removal of dust and dirt from shakeout stations, sand handling and conditioning systems. Sludge disposal is perfectly simple—you use nothing more than a skid on a lift truck. We urge you to consider carefully the *dollar-saving advantages* of an investment in a Schmieg stainless steel Arrester Unit.

Consult Schmieg engineers regarding your problems of dust and fume control.

THE *best* AIR PURGE *is* CENTRI⊖MERGE

Schmieg INDUSTRIES INC.
Engineers & Manufacturers

302 PIQUETTE AVENUE • DETROIT 2, MICHIGAN

Add Comfort to Your Safety Program ...get WILLSON

Style F350

COMFORT IS IN THE SADDLE ... With this broad saddle nose bridge, there's less fatigue in wearing these goggles over long periods of time in heavy duty operations. Super-Tough* lenses, of course.

Style No. 1

AN OUNCE AND A QUARTER OF PREVENTION ... Lightweight, form fitting MONOGoggle can be worn all day with comfort. Tru-Hue green or clear plastic full vision interchangeable lens has high impact strength.

Style No. 45D

THIS LIGHTWEIGHT TAKES ON ALL DUSTS ... Large throw-away filter and flexible molded face piece assure easy breathing and comfortable, snug, face fit. U. S. Bureau of Mines Approved.

*Reg. U. S. Pat. Off.

For complete information on these products and their application, as well as many more eye and respiratory protective devices, get in touch with your nearest Willson distributor or write us direct.

GOGGLES • RESPIRATORS • GAS MASKS • HELMETS

DOUBLE WILLSON PRODUCTS INCORPORATED

READING, PA. U.S.A.

237 WASHINGTON STREET, READING, PA., U. S. A.

the chills employed in iron roll making are cleaned on the inside by a revolving brush as shown in Fig. 6. The surface is sprayed with a special blacking. One or a number of chills form the body of the roll mold, while the necks and wabblers are formed in sand. The assembled mold for a large plate mill roll, set up in a pit for pouring is shown in Fig. 8. In contrast to steel foundry practice, the long runners are attached to the outside of the mold, but in the majority of instances one runner is sufficient. Metal enters the mold near the bottom through a gate set at a tangent to give the metal a whirling motion.

As shown in Fig. 7 all the men engaged in pouring the metal wear goggles, safety shoes and asbestos leggings. After the bottom of the mold is filled slowly, the remainder of the metal is poured as rapidly as possible, aproximately at the rate of 1 ton per second. The roll from the mold shown in the illustration is 28 in. diameter and 14 ft long. The weight is 16 tons and cost to the customer about $4000.

Smaller molds, as shown in Fig. 9, are set up in groups in a pit and poured from a single large ladle. These smaller molds require only one runner.

National Founders to Meet Nov. 18-19

National Founders Association will hold its annual meeting at the Sheraton Hotel, Chicago, Thursday and Friday, Nov. 18-19. Sessions will emphasize management, legislation, labor relations and engineering problems.

The tentative program follows:

Thursday, Nov. 18

9:00 a.m.—Registration—Spanish Court

10:00 a.m.—Call to order—Tropical room
Presentation of film, "This Is Our Problem," with comment by an outstanding public relations consultant.

12:30 p.m.—Luncheon
"A Favorable Climate for Constructive Management," by a United States senator.

2:00 p.m.—"Production for Better Living," by Robert Ruhl, senior partner, Stevenson, Jordan and Harrison, engineers.
"Improvements and Safeguards in Labor Contracts," by Lee C. Shaw, attorney, Seyfarth, Shaw & Fairweather.
"Planned Safety and Health in the Foundry," by Roger Bronson, Bronson, Dennehy, Ulseth Inc.

6:00 p.m.—Social hour—Gothic room. Reception with the press.

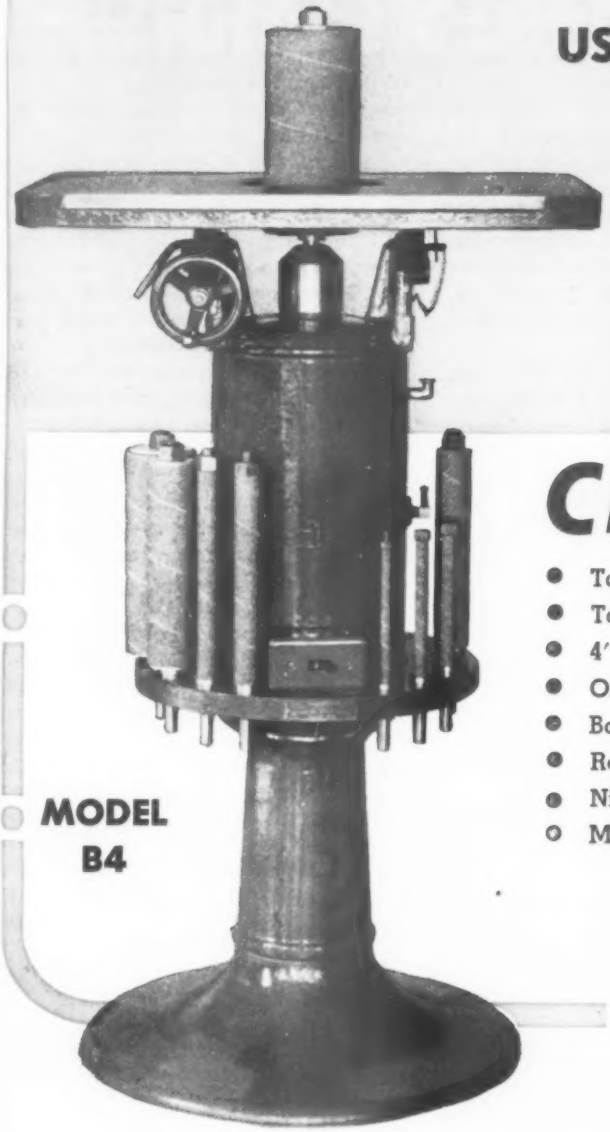
Friday, Nov. 19

9:00 a.m.—Call to order—Tropical room
"The New Look in Washington," by L. E. Roark, executive vice president, National Founders Association.
Reports of committees.
Election of officers.
"The Foundry of Today and Tomorrow," by a prominent foundry operator.
"Management's Role Under the Labor Relations Act," by a member of the joint congressional committee.

USE FREEMAN EQUIPMENT IN YOUR PATTERN SHOP

FEWER DELAYS AND MORE PRODUCTION

WITH A STATE OSCILLATING SPINDLE SANDER



MODEL B4

CHECK THESE FEATURES

- Table tilts 45° by worm and gear device.
- Table quickly returned to exact horizontal position.
- 4″ hand wheel for tilting.
- Oscillating mechanism runs in oil.
- Ball bearing motor enclosed in machine base.
- Rectangular table 20″ x 24″.
- Nine quick change spindles (as shown) ready for use.
- Machine weight 285 lbs.

MODEL D15

YOU GET *VALUE PLUS* IN A STATE 15″ DISC SANDER

- Table 10″ x 22″ tilts 45°.
- Table quickly returned to exact horizontal position.
- Vertical adjustment of table—center to bottom of disc.
- Furnished with mitre gage, dust bag and extra disc.
- Machine weight 300 lbs.

Write Now *for a complete bulletin*

THE FREEMAN SUPPLY CO.

Pattern Shop and Foundry Supplies and Equipment

Mahogany and Pine Pattern Lumber

1152 E. BROADWAY TOLEDO 5, OHIO

THE ADVENTURES OF Bill

By PAT DWYER

Drawings by RICHEY

LETTERS may bring any kind of news," I remarked idly to Bill the other night. "I had one some time back that developed into a curious bit of correspondence. Envelope and letterhead carried the name and address of one of our state colleges. I guess that is near enough for identification, since they all bear a certain family resemblance. Every once in a while one breaks through with a red-head genius equipped with a pair of winged heels, the ability to propel himself a certain distance in the air or over the ground, or some other vindication of the popular theory that a small square of parchment, smaller and smaller in recent years, automatically increases the commercial value of the candidate on the hoof."

"All argumentive points," Bill said, "and as sharp and numerous as the quills on a porcupine—

"Another time, my good man, another time. This discussion has nothing to do with *Wild Animals I have Known* and/or lived with. Stick your porcupine back in its cage and let us get on with the work in hand. This correspondence was with a member of the college staff. Either a cagey disposition—hinted at by a scottish name—or some other reason left me in doubt up to the end, whether—let us say A. B. McGregor—was a man or woman. Apparently a professor or some person in authority. I had no hesitation or difficulty in including this particular McGregor in my list of Stout Fellas."

"Ah. A bit over weight and paunchy. Occasionally a male professor touches 197, but I never have seen a female specimen over 135. However, I must admit that my acquaintance with the brotherhood and sisterhood is rather limited."

"You do not need to tell me. The Noble Order of Stout Fellas is not based on avoirdupois or troy listings. Take a gander through the public library some time and see what a gent named Percy Wren has to say about Beau Guest and other related characters."

"Is that the guy who stole the diamond from his aunt, then joined the French Foreign Legion and all that kind of stuff? You don't need to tell me. I saw the picture one time. What I should like to know is how this Wren character managed to insinuate himself in the present strictly private conversation."

"So far as I can see only two people are present. They might be roughly described as the speaker and the listener. Since I started the thing, I don't think I am straining the bonds of common courtesy if I continue in the first role. What is there to stop you from folding the long ears, closing the transverse gap under the beak, and, as our crabby old teacher of the long ago was in the habit of saying, 'Please pay a little attention.' I still have a copy of the correspondence and can roll it off to you almost, but of course not quite as fast as the baseball game announcer who goes up in a tail spin at every play. Tisn't often I am forced to listen but each time, in spite of my irritation, I wonder why he does it, and even to a greater extent I wonder how he does it. Must have one of these super blast pipe nozzles for a throat lining."

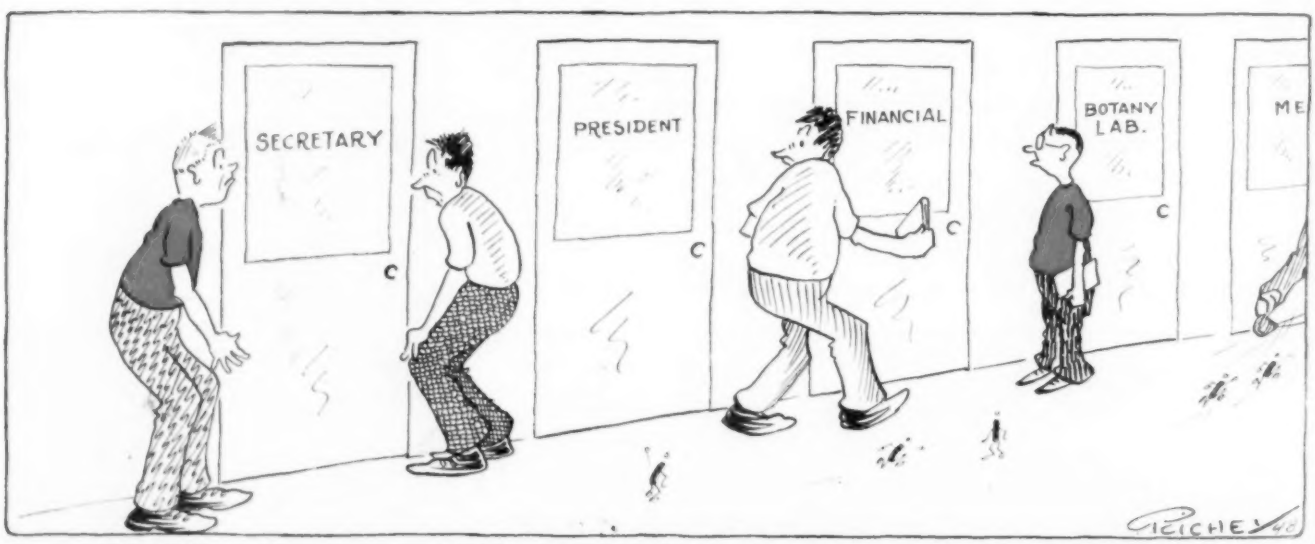
"What with the cold weather and old age and one thing and another," Bill said, "it may be that I am slowing down a little. You will pardon me," he added politely, "if I fail to note the, no doubt, intimate connection between a professor, a baseball or football announcer, and a blast pipe nozzle. In other words, what are you talking about?"

"That's the proper spirit. A speaker of any kind is highly encouraged and gratified to find that he has grasped and is holding the attention of his audience. Hold that pose, my boy, and we shall get along with the work, eyes and teeth shining and ears cocked slightly forward. The first letter was brief. A short letter has its merits, but there is such a thing as a shorty that is too short:

Gentlemen: Would you please write us what information you have pertinent to the following. As a class project we desire to undertake the casting of names, in letters approximately an inch high, in metal. We would like to know to whom we should write for a method of procedure and to present our local problems not outlined in most bulletins.

"Clearly this called for a bit of thinking and resulted in the following reply:

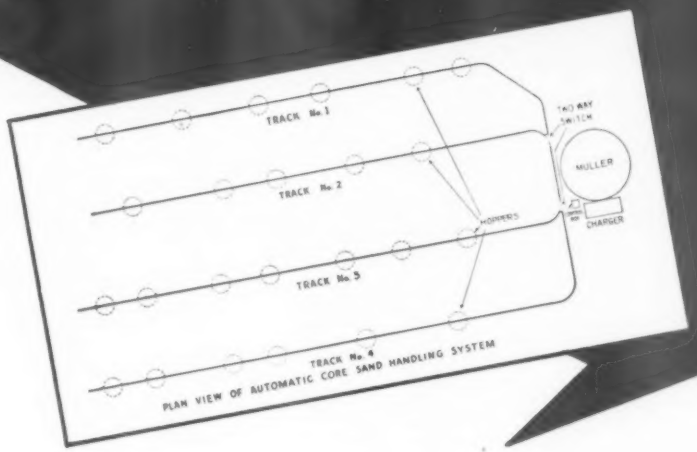
(*Continued on page* 204)



Little Willie Freshman now can find his way around without begging the pardon of every one he meets

Automatic Dispatch System

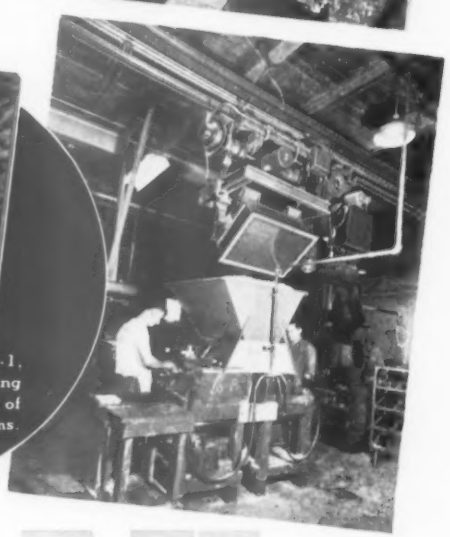
delivers 25 tons of core sand per day!



PLAN VIEW OF AUTOMATIC CORE SAND HANDLING SYSTEM

This compact system requires only two men to keep 24 core benches supplied with fresh core sand. Charger receives sand from underground conveyor. Sand is loaded and automatically dispatched and dumped to any one of 24 stations, on four tracks, by push button control. Track switches are manually operated. Each track can be increased to 16 stations or 64 in all. This is another of the hundreds of American MonoRail installations that have cut handling costs. Let an American MonoRail engineer show you how it can be done in your business.

SEND FOR BULLETIN C-1, a 56-page book showing successful applications of American MonoRail Systems.



THE AMERICAN MONORAIL COMPANY

13104 ATHENS AVENUE **CLEVELAND 7, OHIO**

Easy as fishin'!

and surer

You'll never find any easier way to profitable foundry operation than the reliable and efficient Crucible melting method.

It is also economical, flexible and metallurgically sound. No other method will consistently produce a higher percentage of sound castings than Crucible melting: none provides more perfect control of the melt. For small or large tonnage, the results are uniform.

When you are looking for these advantages, install Crucible Furnaces.

Write for your copy of
"Crucible Melters' Handbook."
It has information you
will want to use.

CRUCIBLE MANUFACTURERS ASSOCIATION

90 WEST STREET, NEW YORK 6, NEW YORK

(*Continued from page* 202)

From your recent inquiry we cannot decide whether you want to know how to cast letters 1-in. high, or, if you want to get in touch with some person who is familiar with the work, or some person who has prepared a course of instruction on this subject for class use. If you will come out of concealment of the tall timber and outline your proposed project, and exactly what information you need, we shall be glad to co-operate to the extent of our knowledge. If your (plural) knowledge of the noble art of casting in metal is as dim and vague as your inquiry would indicate, we admire your courage while deprecating your judgment in tackling what probably is the most difficult branch of the metalworking industry.

Certainly it is possible we have received a mistaken impression. If you will be good enough to write us again, we probably can supply an answer. Don't stint the paper, or hold the message down to condensed telegraph size. Go ahead. Spread yourself all over the page and tell us all about this job you have in mind. As with our fellow professionals in law or medicine we need all the symptoms and related factors before we attempt a diagnosis.

"This evidence of a degree of friendly interest brought the following reply:

I have just finished reading your interesting letter and as I dictate the reply I have before me the carbon copy of my letter of inquiry. The first thing occurring to me is that I surely owe you an apology for my ambiguity. My letter probably was not intelligible because in the writer's mind there was so little knowledge on the subject of the letter—so little in fact that an intelligent inquiry could not be formed. I'm very sorry, and though I do not know much more now than when I wrote the letter you received, I can go more into detail regarding my ignorance. We want to have something we cannot afford to buy. Our only way out is to make it ourselves—if we can.

This is a small college, one of several similar institutions in the state. We have a lot of competition in the committees of the state legislature when we request funds for the many things we actually should have. Many items we should like to have, are not mentioned in these requests. These are regarded as nonessentials and therefore any request would be regarded as 'sticking out our chin' by the self constituted experts who say 'You can get along without that!'

It occurred to some of us that it would be a nice thing to provide and fasten metal signs to our numerous doors to indicate the nature of what might lie behind the portals. At present each door has a small brass number. Long-time residents know that the number 123 for example is on the door of the social unit. The system is a mystery to the incoming freshman. He does not know whether the numbered door leads to the social unit, a class room, a private office or what have we!

A few years ago all the smart auto owners, or near owners, had the name of the home town done in shin-

(*Continued on page* 208)

5 REASONS FOR CLEVELAND TRAMRAIL CORE-HANDLING EQUIPMENT

1 ELIMINATES REHANDLING — Delivers cores from coremaker to oven, thence to molding floor, via overhead tramrail route without rehandling.

2 CUTS COSTS — Saves time, speeds production, cuts costs. Coremakers spend more time making, less time handling cores.

3 REDUCES BREAKAGE — Easy operating carriers on smooth overhead track eliminate damaging vibrations and shocks. No chafing, cracking, or breaking of cores in transit.

4 NO REINFORCEMENT WIRES — Because of cushion-like handling with Cleveland Tramrail reinforcement wires can be eliminated for many cores. (Removing core wires sometimes costs more than cores themselves.)

5 WITHSTANDS OVEN TEMPERATURES — Cleveland Tramrail carriers are designed for usual oven temperatures up to 450 degrees F. No "sticky" wheel bearings.

Cleveland Tramrail core-handling equipment is inexpensive. It is easy to install in present plants. It is ideal for use through continuous baking ovens.

Now is the time to consider establishing real efficiency in your core department. Have an experienced Cleveland Tramrail sales engineer offer you recommendations — no obligation, of course.

GET THIS BOOK!

BOOKLET No. 2008. Packed with valuable information. Profusely illustrated. Write for free copy.

CLEVELAND TRAMRAIL DIVISION
THE CLEVELAND CRANE & ENGINEERING CO.
3819 EAST 286th ST. WICKLIFFE, OHIO

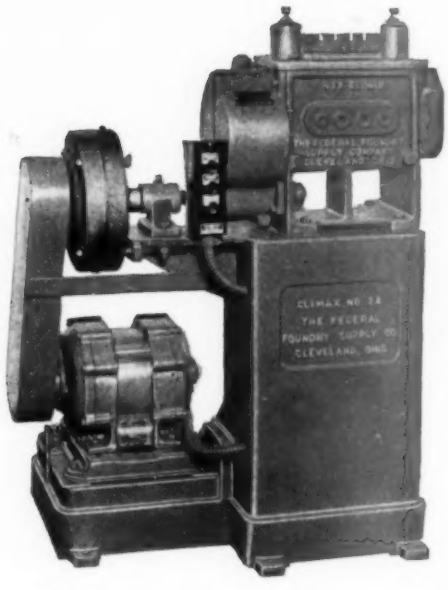
CLEVELAND TRAMRAIL
OVERHEAD MATERIALS HANDLING EQUIPMENT

FEDERAL SUPPLIES

FEDERAL'S LOWE SIFTER

Save money by faster sifting, better sand conditioning with a Lowe Electric Sifter. Features: greater screening area, enclosed ball bearing motor, more shoveling room. Write for information. Prompt delivery.

CLIMAX WIRE STRAIGHTENERS



Any foundry, large or small, can cut production costs by straightening and reusing core wires and rods. With a Climax Wire Straightener this can be done quickly, economically, safely — by unskilled labor. A complete descriptive circular is yours for the asking.

The "Lightning" Clamp

The "Holdtite" Clamp

CLAMPS

Federal offers two types of flask clamps.

The "Lightning" clamp is an eccentric type, requiring no wedges and available in two sizes: No. 2, 8" to 12" and No. 3, 12" to 20".

The "Holdtite" is an adjustable clamp designed for use with wedges and is also offered in two sizes: No. 1, 13" to 23" and No. 0, 18" to 33".

Both clamps made of sturdy malleable iron, rigidly reinforced to prevent distortion.

FEDERAL'S WONDER CUTTERS

Two compact cutters for rods and band iron. One cuts up to 5/8" round and the other to 7/8" round. Readily mounted on any bench. Users say they're worth their weight in gold!

RUBBER-COVERED SHOVEL HANDLES

The best insurance you can buy against damaged patterns, core boxes or flasks. The pean-shaped grip is ideal for ramming.

They will fit your present shovels or you can order your next shovels with them already installed.

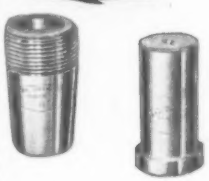
TWISTED STEM CHAPLETS

The chaplet with everything. The "Twisted Stem" promotes rapid complete fusion. Not deformed, the stem has no weak spot to burn in and permit core shift. Made in a complete range of sizes. Samples of the size you use, gladly submitted.

"The Twist Does The Trick"

WATER BRUSH

Easy to Grip and Hard to Tip. It can't leak and one filling lasts all day. Does not tire the molder's hand.



BLAST CLEANING NOZZLES

Air consumption is reduced and the blast is concentrated because the hole in the nozzle wears very slowly. Made in all sizes and types. Write for circular.

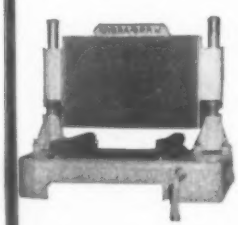
FEDERAL JOLT MACHINES

Air operated, fool-proof jolt machines that ensure uniform cores. Sturdy cast iron construction with no external valves to wear out. Made in four sizes. Get our prices and deliveries.

SHUR-SPOT SPRUE

Designed for use on squeezer-made molds, Shur-Spot squeezes right down with the sand. When the squeezer board is removed, the Shur-Spot pops up and can be lifted right out. The result is a fully completed and properly located pouring sprue that requires no finishing. Shur-Spot Sprue eliminates danger of falling sand.

For complete information on the Shur-Spot Sprue, write for the circular on this low-priced easy-to-use item.



FEDERAL'S "VIBRA-DRAW" CORE DRAWING MACHINE

Cuts costs in your core room by making it easy for every core maker to draw perfect cores as fast as he can fill the core box, place it against the vibrating head and lift the box. Made in two styles: the floor model and the portable bench model shown here. Immediate delivery — write for details.

FEDERAL VIBRATOR No. 2 and 5

Federal's own make and available for immediate delivery. Hard-chromed piston guarantees long life. For 110 volt, 60 cycle, single phase operation. $15.60 each, f.o.b. Cleveland; No. 5 for heavier duty—$20.40 each.

Federal also has a new "convenience outlet knee switch." No taping, soldering or wiring. Plug in—that's all. Carried in stock. $6.50 each, f.o.b. Cleveland, Ohio.

THE FEDERAL FOUNDRY SUPPLY COMPANY

4600 East 71st Street • Cleveland 5, Ohio

CROWN HILL, W. VA. • CHICAGO • MILWAUKEE • DETROIT • ST. LOUIS

CHATTANOOGA, TENN. • ST. PAUL • NEW YORK • RICHMOND, VA. • UPTON, WYO.

mberlain Co., Los Angeles, Calif. · Pacific Graphite Works, Oakland, Calif. · LaGrand Industrial Supply Co., Portland, Ore.

Overseas Commodities, Ltd., Vancouver, B. C. · Newman Foundry Supply, Ltd., Montreal, Que.

HAUSFELD FURNACES

FOR GAS OR FUEL OIL

ARE MEETING EVERY EXACTING REQUIREMENT

FURNACES FOR
BRASS • ALUMINUM • MAGNESIUM
AND ALL OTHER
NON-FERROUS ALLOYS

HAVE YOU INVESTIGATED THEM FOR YOUR MELTING PROBLEMS?

The Campbell-Hausfeld Co.
300-320 MOORE ST. HARRISON, OHIO

(*Continued from page* 204)

ing metal script and fastened to the radiator. I remember vaguely current advertising of the period claiming that the metal work easily could be done in the home. I consulted our manual arts teacher, a very clever, versatile, intelligent and experienced man. He remembered the automobile script, but had no idea where or how the work was done. I wrote to one of our state institutions of learning staffed by bright minds, experts in almost any endeavor one might choose to study. I outlined our problem considerably more in detail than in my first letter to you. A reasonable time has elapsed, but up to the delivery of the latest mail, no reply of any kind has been received. Ignorance and persistence induced me to submit by problem to an old stand-

Trembling hero wonders what's in it

by *Popular Mechanics*. The editor of this magazine very kindly referred me to you, and that brings us down to date.

1—Have you any knowledge of the radiator script? 2—We propose to make metal name plates lettered to read *Office of The President, Botany Laboratory, Financial, Secretary,* etc. We have time, some equipment, ambition, enthusiasm, a fair amount of savy as given by the printed word, a lot of patience—and we have met and conquered apparent failures in other projects. 3—Perhaps a printing establishment might be of assistance. We could obtain printing help from a local factory engaged in the production of shipping crates. 4—Local gas is low grade seldom up to and often far below 950 Btu. We can obtain charcoal. We have an air compressor, a blacksmith forge. If necessary we probably could obtain other necessary materials. 5—Last but not least, perhaps the entire idea is impractical.

We do not expect to have a demonstration of the metal caster's art as seen on the desk of the president of the First National Bank. All we want is something durable—student proof if some genius could invent anything to fill that niche. Preferably of a metal which would not melt on a warm

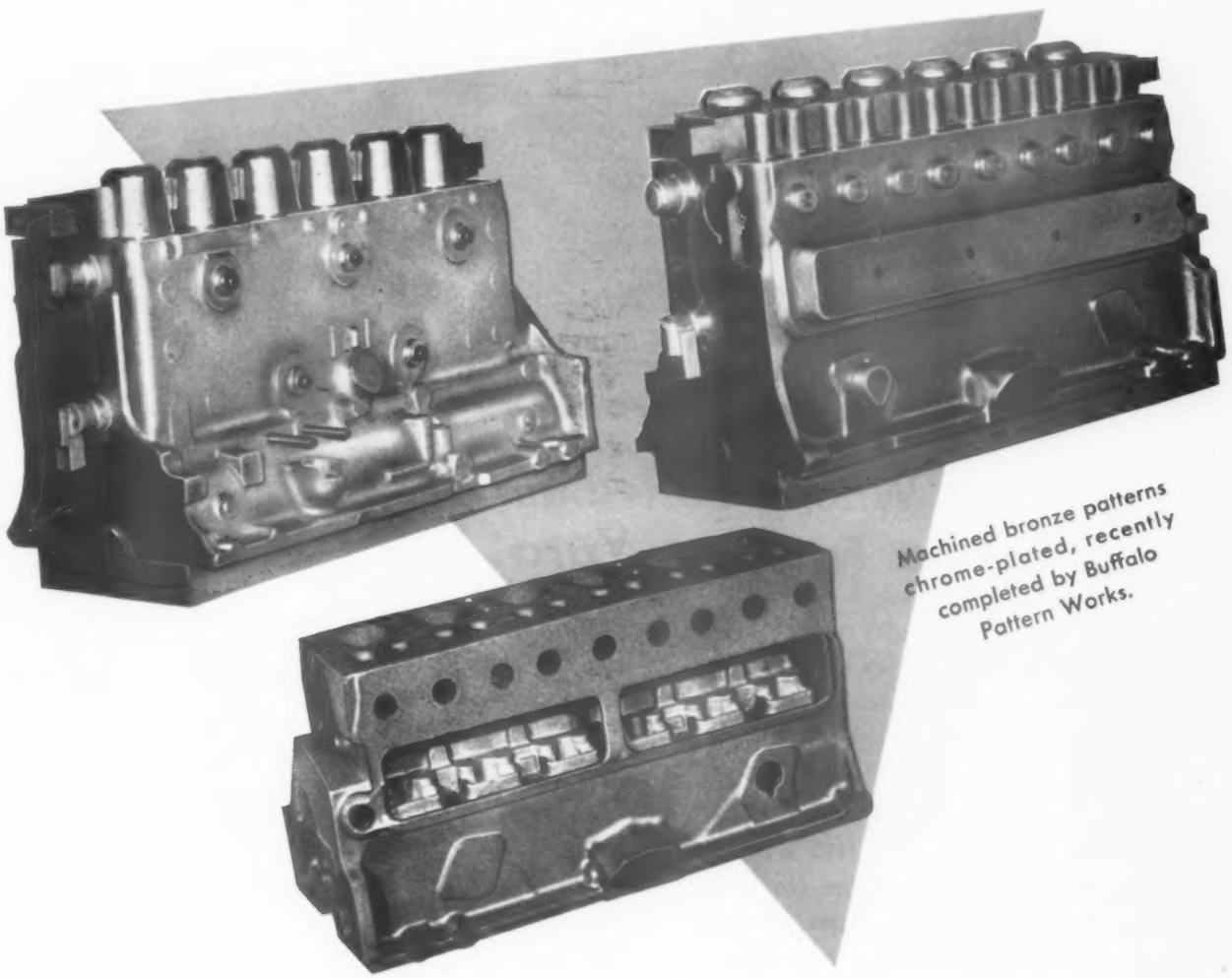
(*Continued on page* 210)

BUFFALO PATTERN WORKS

1893 1948

55 Years

OF PRODUCTION PATTERN ENGINEERING



Machined bronze patterns chrome-plated, recently completed by Buffalo Pattern Works.

Metal Production Pattern Equipment • Core Gages • Duplicator Models

Blow Core Box Rigging • Wood, Plaster and Experimental Patterns

We invite you to consult us on your pattern engineering problems.

BUFFALO PATTERN WORKS

830 HERTEL AVE. . BUFFALO, N. Y. RI. 3512

Cut Costs Where Costs Start . . . in the Foundry Yard!

Speed up your foundry yard unloading, rehandling and storing of foundry supplies and materials. Cut these non-processing production costs, save demurrage charges, reduce handling time!

New, higher speed NORTHERN OVERHEAD ELECTRIC TRAVELLING CRANES will minimize man-hour service time, set the pace for faster, safer material handling, cut over-all costs where costs start.

★ **Let us send you Bulletin No. 122-C** ★

OVERHEAD ★ ELECTRIC CRANES ★ AND HOISTS ★

NORTHERN ENGINEERING WORKS

2615 Atwater St., Detroit 7, Mich.

(*Continued from page* 208)

day. But not necessarily of the finest bronze. If you do not think the idea is practical, tell me so, as bluntly as you please.

"If there is one thing I hate more than another," Bill said, "it is to write a letter which could be compressed into the single word *No*. This job could be handled by any experienced, ingenious and inventive type foundryman, but apparently no member of the ancient profession ever has come within shouting distance of the sacred campus. Off-hand I am rather surprised the manual arts teacher did not offer to have a go at it. Possibly he was a cagey lad who preferred to profess ignorance as the easier horn of the dilemma. Actual performance would involve a considerable degree of extra work, especially in rigging a furnace to melt brass, bronze or aluminum. Did you touch on all these points in your reply?"

"Well," I admitted, "as you very astutely pointed out some time back, the entire answer could be compressed into the single word *No*, but I thought it only fair to point out some of the lofty hurdles that barred the track. This is the final chapter. I never heard whether the problem was solved or abandoned."

I could give you the names of a dozen firms in position to supply plain or ornamental letters, monograms or special designs. In fact, I was talking to one of these people today and despite my explanation that you wanted to do the job yourself, he volunteered to write you, send you his catalog and supply hints on how you might do some of the work.

As I get your situation from your recent complete and friendly letter, you are more interested in adding to the students' activities, than in getting the signs for the doors. Frankly, unless you have a practical foundryman in the student body or on the staff, or available on the outside, I do not think your plan is feasible. To reverse an old, old standard of comparison, because a small lemon is sour, it does not necessarily follow that a large lemon is sourer. In your case, because large castings presumably present difficulties, it does not necessarily follow that small castings can be made by any person without the knowledge and training. Castings have been made with minimum equipment and under adverse conditions, but the makers were familar with materials and methods. Even with elaborate equipment the work cannot be done by an amateur. Under primitive conditions, any attempt is hopeless.

In your place we sould drop the idea of making the castings, and devote our financial gifts to raising enough money to buy letters from a reputable manufacturer. How? says you:

1—Take up a collection among the student body (Not so good).

2—Organize a bingo, crap or other

(*Concluded on page* 212)

"Foundry Equipment Arranged to Your Individual Requirements"

What JEFFREY Makes:

- MOLD CONVEYORS
- FLASK FILLERS
- AERATORS
- SANDITIONERS
- PADDLE MIXERS
- SCREENS
- BIN VALVES
- CONVEYORS
- BUCKET ELEVATORS

A Jeffrey apron conveyor used for sprueing and sorting castings.

A typical view of Jeffrey sand handling and preparation in a large foundry.

-Here again.

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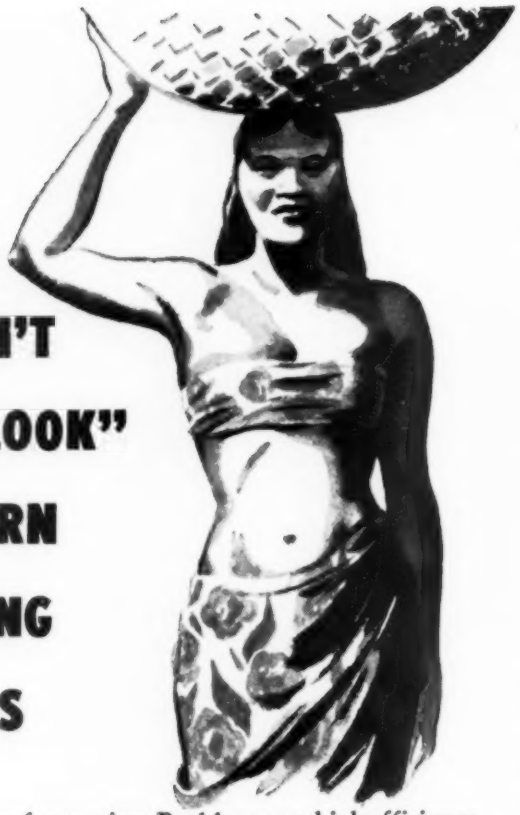

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GRAVITY & POWER CONVEYORS

(*Concluded from page* 210)

variation of the well know game of chance.

3—Get a few of the wise boys to invest a small sum on the horses (Open to all).

4—Put the proposition up to one or more of the alumni. Some of these birds carry so much of the Stuff when they walk abroad they jingle like tambourines.

5—Set apart a brass letter day, and have the student body pester natives and visitors with tin cups, eye shades and shivery dogs with what is known among the profession as a graveyard cough.

6—What is the matter with having your manual arts teacher whack out the letters in wood, faced with brass or aluminum sawed from a sheet of metal?

"You might add a postscript," Bill grinned as he departed. "Through a species of low animal cunning every student, with shirt tail flying in the breeze, knows what is inside every room within the first week, whether the door has a name or a number, or simply nothing!"

PATTERNS, MOLDING METHODS FOR STEEL CASTINGS

(*Continued from page* 83)

type is divided into an upper and a lower portion, loosely held together with dowels, and joining each other at a flat face common to the two halves. In using such a split pattern, the lower part is placed on a bottom board, flat side down, a wooden or metal frame called a "flask" is set on the board and clamped to it, and molding sand is rammed inside the frame and against the bottom board and pattern, as shown in Fig. 2. In this view, a half pattern of somewhat complicated outline, for which a flask of special shape is required, is set on a heavy board. The flask has been clamped to the board and the sand is being compacted with air-operated rammers.

In ramming a mold, the operator first places a few inches of sand over the pattern and bottom board, and then packs it down with a tool called a rammer. Before the introduction of compressed air in foundries, rammers were long steel bars with one round, flattened end about 3 in. in diameter, known as the butt, and an oblong blunt piece, called the pein, on the other. The pein was about 4 in. long, 3 in. wide, and 1 in. thick, so that this end of the rammer looked like a blunt-ended chisel. Contrary to what might be supposed, the pein end of the rammer was used to com-

(*Continued on page* 214)

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THE J & J JOHNSTON JENNINGS CO.

867 Addison Road • Cleveland 14, Ohio

IMPROVED UP-TO-THE-MINUTE MOLDING MACHINES FOR EVERY NEED

(*Continued from page* 212)

pact sand tightly against the pattern, because the broad-ended butt would pack it only to a limited depth. The butt was reserved for tamping down the last sand in the mold, to keep it from falling out. Rammers of this type, usually of wood rather than metal, are still used to some extent in ramming small molds and cores on benches, but are almost never employed for larger work. In Fig. 6, two of these tools are shown, being used to ram up a cement-bonded sand core in a skeleton corebox, such as will be described further on.

Today, the back-breaking job of ramming in sand with these heavy tools has been lightened by the introduction of air-operated rammers. To compress sand tightly in small molds, these are usually provided with rubber-shod pein ends, and bench molders in many shops use such equipment. For ramming larger molds, a butt end tool is more often used, somewhat smaller in diameter than the butt of the old hand rammer. Several of these tools in operation are shown in Figs. 2 and 8.

The first few inches of sand over the pattern must be carefully rammed, so that it is well compacted, but the molder has to be careful not to strike the pattern and damage it. When the first layer of sand has been thoroughly compacted, more is shoveled in and gone over with the rammer. Each layer is left loose on the top so that it will adhere properly to the next one added, and form a uniform mass. When the flask is full, the last sand is "butted off" flat.

Where the sand is rammed straight down on the pattern, it is thoroughly compacted. Ramming sidewise, or even at much of an angle with the vertical, is not easy, and sand so rammed will seldom be as tight as that rammed straight down. Moreover, sand is by no means free-flowing and a vertical blow presses it sidewise to only a limited extent. To properly compact the sand throughout the mold, therefore, the molder has to ram quite close to all vertical surfaces. This failure of sand to flow sidewise under vertical pressure, as will be discussed in more detail later, has to be constantly kept in mind in operating molding machines of the squeezer or jolt type.

INDUSTRY SHOW: Display booths sponsored by two foundries and illustrated here were among the key exhibits at the "Made in Racine Centennial Exposition" held on the lake front of that Wisconsin city this summer. The industry show conducted by the Racine Manufacturers Association, attracted more than 45,000 persons from June 29 to July 3. Exhibit of the Standard Foundry Co. featured its cupola-electric furnace duplexing method of producing high strength iron for castings weighing from 16 to 1100 lb. High light of the exhibit of Belle City Malleable Iron Co. and its affiliated Racine Steel Castings Co. was a life-size model of a furnace being tapped. In the background were enlargements of different plant scenes

When the flask is filled, the sand is struck off level with a long straight bar, as illustrated in Fig. 2, which shows two men striking off the sand in a cope flask. Another board is then placed over the sand and clamped down, and the flask with its two boards is turned over. The first board is then removed and the upper part of the pattern is placed on the lower portion, with the connecting dowels in place. A second flask is set on the first one, and properly located by pins screwed into one part and passing through holes in the other. Fine dry parting sand is sprinkled on the firmly compacted sand in the lower half of the mold, and the upper piece of flask is then in turn filled with tightly rammed sand. When filled to the top, this upper half of the mold—cope—is lifted off the lower part, or drag, the parting sand at the joint preventing the rammed molding sand in the two parts from sticking together. The cope is then rolled over and set down.

Need Stiff Boards

Detailed descriptions of flasks, bottom boards and other rigging will be found in a separate chapter. It is enough to say here that the boards on which patterns are set and rammed, though generally of wood, must be heavy and stiff enough not to be distorted by the weight of the sand or the pressure exerted by the rammers, so that they will stay flat. For comparatively small jobs, this requirement may call for no more than a board composed of two thicknesses of wood laid at right angles to each other. For larger pieces, however, the boards usually must be several inches thick, made of a number of layers of hard wood, and those for the biggest jobs may even have to be backed up with heavy iron or steel plates, to keep them from bending when lifted for rolling over.

The boards used to cover the sand in the drag, which are clamped to the flask and remain in place until the mold is poured, must also be stiff enough to support the weight of the sand without buckling. For small flasks, they are usually of wood or composition but cast iron or steel plates are preferred for medium sized and large flasks, as they are far less bulky than wooden ones.

On large flasks, many steel foundries today use cast iron or steel grids instead of solid plates. These are sometimes cast integral with the drag flask, and sometimes are made separate and bolted on. They consist of sets of bars running both lengthwise and crosswise of the flask,

(*Continued on page* 216)

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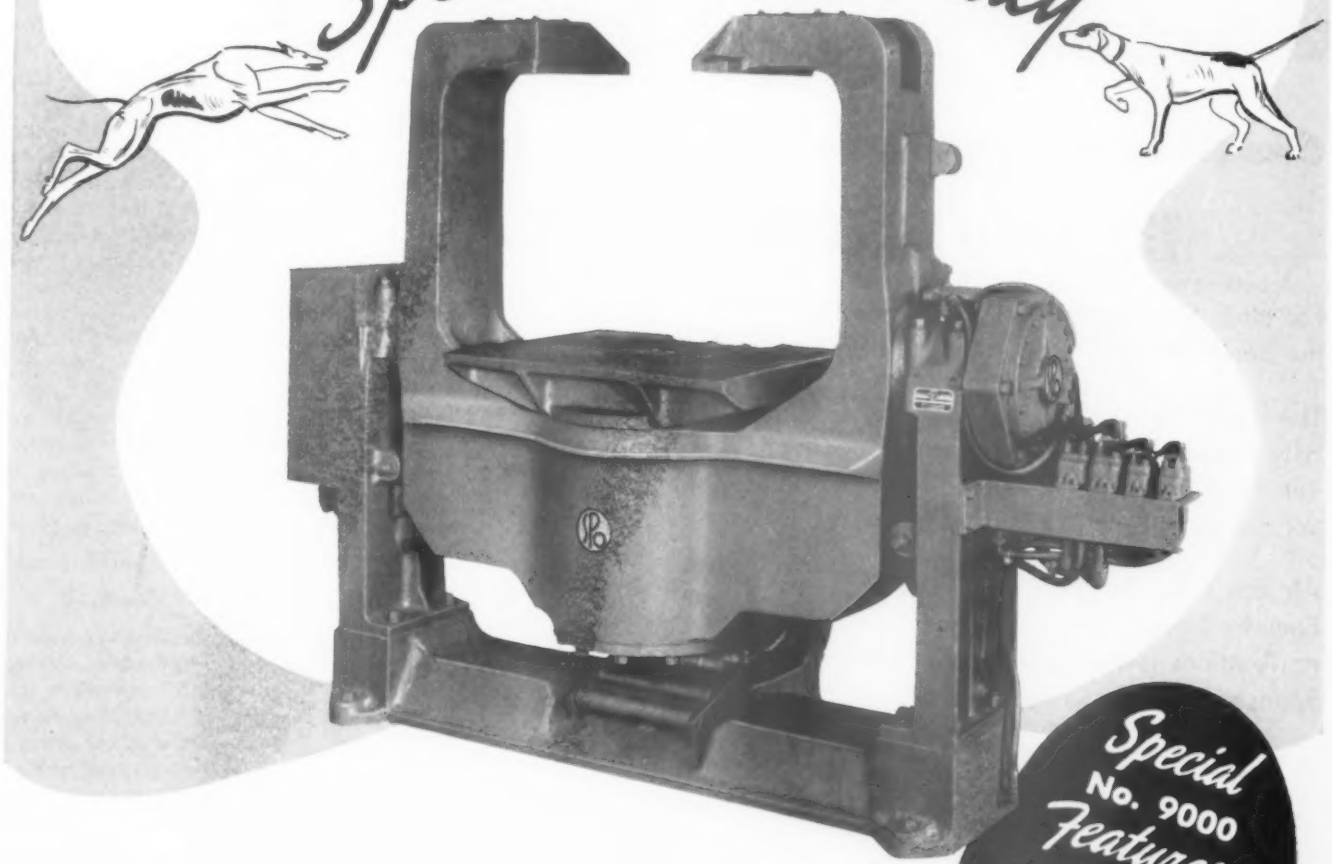

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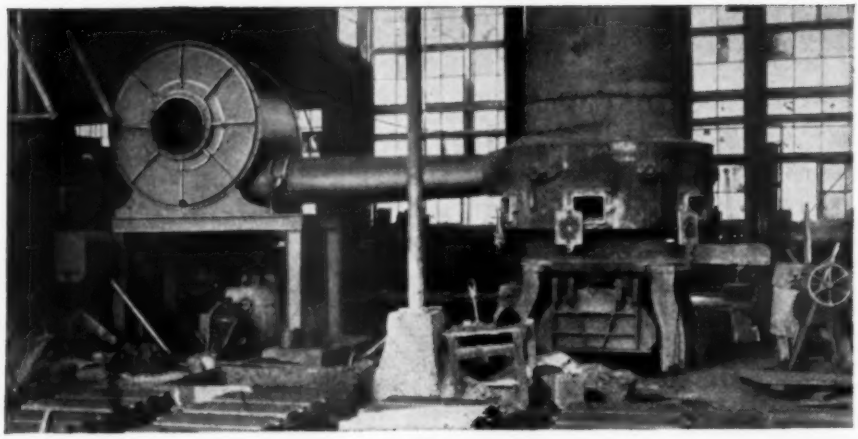

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The very simplicity of the centrifugal design, with wide clearances, only two bearings, and no special foundations is part of its answer. The Spencer Turbo is inherently ideal for foundries because the volume and weight of air can be controlled by hand or automatically.

Air requirements for foundry cupolas are given in the Spencer Foundry Bulletin No. 112, and complete calculations for all Turbo applications including oil and as-fired equipment are given in the Spencer Turbo Data Book No. 107.

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332-A

SPENCER HARTFORD

THE SPENCER TURBINE CO.
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(*Continued from page* 214)

with square openings between them like very coarse mesh wire screens. The bars are thick at tne top and taper to a thin edge on the side toward the flask, so that the openings between them are shaped like truncated pyramids, which readily retain sand that is rammed into them. When using grids, it is of course not necessary to strike off the sand in the drag flask, as must be done before putting on a bottom board. A large drag flask with such a grid in place, is shown in Fig. 1.

As will be described in detail later, grids are extensively employed in machine molding, and are then often made integral with the drag flask. As a rule, when used in hand molding, they are taken off in order to ram the drag, since in most cases it would not be possible to get at every part of the mold and do a proper job of ramming, through a grid. When the drag has been rammed nearly full, the grid is clamped or bolted in place as a plate would be. Sand is then shoveled in and heaped up over the bars, and butted down between them with the rammer. In machine molding, grids save a great deal of time, compared to the use of plates, and even in hand work are often applied quicker than a plate would be.

Drag Is Plain Frame

As the sand in the drag part of a mold is supported by boards, plates or grids, it cannot fall out when the drag is rolled over. The drag flask, therefore, is usually a plain frame. Small copes also need no special rigging to hold the sand in place when the cope is lifted off the drag. When the area of the cope exceeds a certain figure, however, the sand would fall out if it were not supported by special means, and cross bars are then required to divide the flask into two or more spaces, each small enough to retain the sand in it when the flask is lifted. For small jobs, one or two cross bars will suffice. As the area of the flask is increased, more bars are needed, and both transverse and longitudinal ones are provided. They should preferably extend to within an inch or two of the pattern and the upper surface of the sand in the drag. "Stronger" sands will hold up with a larger space between bars and pattern than weaker ones, so that in dry sand work this space may be greater than in green sand molding. In cases such as will be described presently, when the sand of the cope extends below the lower edge of the flask, the cope bars are

(*Continued on page* 218)

Rolling Drawer Core Oven

An improved convection, gas fired, recirculating oven. Operation of drawers is entirely selective. Each drawer furnished with individual operating equipment.

FOUNDRY OVENS from Rolling Drawer to Large Standard and Special Types

Carl-Mayer CREATIVE ABILITY wins THE ACCLAIM OF OUTSTANDING FOUNDRIES.

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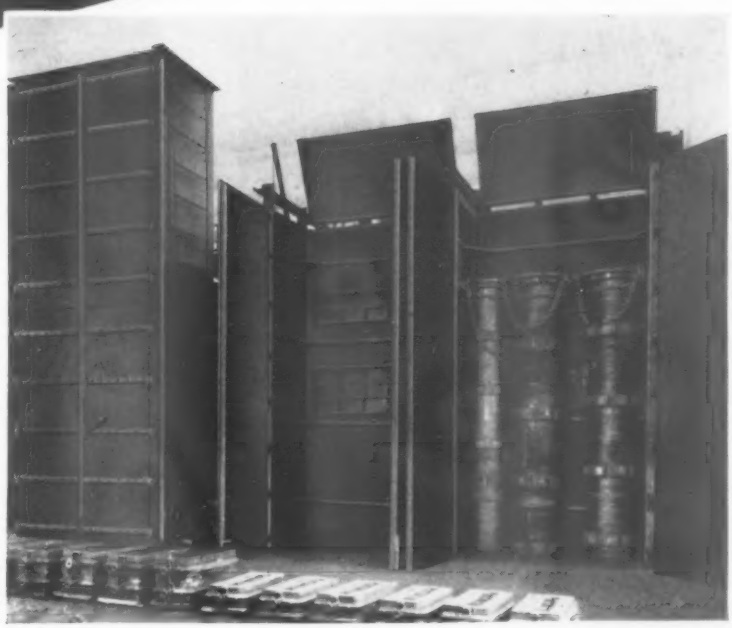

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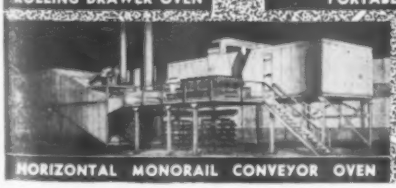


HORIZONTAL MONORAIL CONVEYOR OVEN

The CARL-MAYER Corp.
3030 EUCLID AVE., CLEVELAND, OHIO
CORE AND MOLD OVENS

(*Continued from page* 216)

so shaped that they reach down far enough to come within an inch or two of the pattern.

Only in small copes can the bars alone be depended upon to hold up the sand, and in larger molds gaggers must be used. These are made of round, square or twisted rods, with 2 or 3 in. at one end bent to a right angle with the rest of the piece. They are set on the first layer of sand placed in the cope, with their long legs resting against the cope bars, or sometimes bent over them. The gaggers are placed about 2 or 3 in. apart, their lower ends forming a sort of loose basket-work across the lower face of the cope sand. Fig. 5 shows a large barred cope flask, with gaggers in place, ready to be rammed up with a sand slinger, a machine which will be described in the chapter on machine molding. With properly shaped cope bars and skillfully placed gaggers, masses of sand that extend a couple of feet below the lower edge of the sides of the cope flask can be successfully lifted. Sometimes the toes of the gaggers are dipped in a slurry of clay and water, to give them a better grip on the sand, sometimes they are used bare.

When the sand is rammed by hand, or by means of machines of the slinger type, and a number of castings are to be made from a particular pattern, it may be desirable not only to shape the cope bars to the outline of the pattern, but to weld many of the gaggers in place, so that they need not be set anew for each mold. In that case they may advantageously be made so that they entirely span the space between two bars, with legs welded to the bars at each end. For repetition work of this sort, too, the loose gaggers are often made double-ended, so that they straddle the cope bars, with ends on each side. With flasks tailored to suit particular patterns, it is of course not difficult to design these special gaggers to fit the places in which they are to be placed. The setting of gaggers in large copes is such a time-consuming task that every effort should be made to reduce the number that must be set by hand.

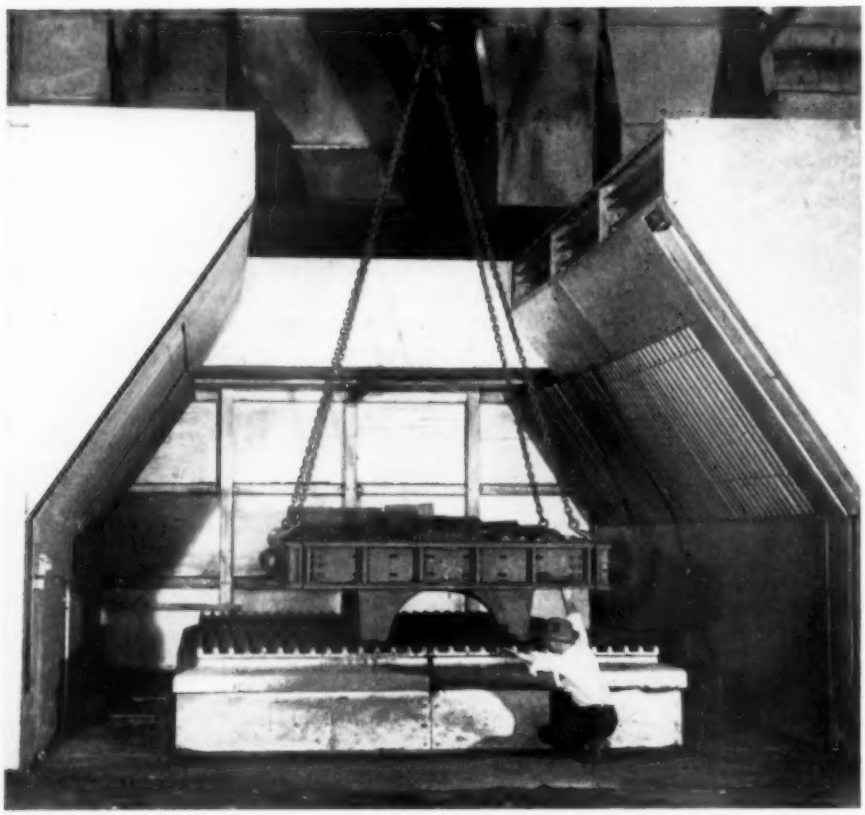
Wood Flasks Have Disappeared

Wood flasks, once widely used, have today largely disappeared from steel foundries, and their place has been taken by flasks made of rolled steel or cast aluminum alloy, or of cast iron or cast steel. They are usually constructed with flanges at top and bottom, which enable them to be readliy clamped to each other and to the boards. Wooden flasks must be provided with pins screwed on at each end of the drag, which engage fittings on the cope, with holes in them to fit the pins. At one end of the flask the holes in the cope fittings are round, at the other end, in all but small flasks, they are made oblong so as to compensate for change in the dimensions of the flasks. The sole advantage of wooden flasks is that their first cost is low, but today even this advantage is more apparent than real, because they require constant renewal, and wood is no longer cheap enough to make them economical.

The smaller sizes of metal flasks are also provided with pins attached to one part, which engage holes in

(*Continued on page* 220)

Ventilating Hood Aids Working Conditions



NEWLY installed at the Trafford Foundry of the Westinghouse Electric Corp. the giant ventilating hood shown here represents another step in the foundry's program to improve working conditions. The 16-ft-high hood, taking up ground space of more than 26 x 32 ft, serves a quad type vibrating shakeout which has a capacity of 60 tons. It is unique in that it is not totally enclosed. This permits free use of overhead cranes.

Three down-draft stacks supply 90,000 cfm fresh air from the atmosphere to form air curtains which prevent the shakeout dust from escaping into the foundry. This also protects the overhead crane men who maneuver the castings in and out of the shakeout. The 90,000 cfm of air curtain is then exhausted from the hood, with the heat and gases from the molding sands through the four up-draft stacks, including an additional 30,000 cfm of air from the foundry. The four stacks exhaust a total of 120,000 cfm.

Built into the hood are four special velocitraps. All exhausted air passes through them and in the process the heavy dust and sand is thrown out of the air stream and trapped. Thus, in the winter, a minimum of expensively heated air is withdrawn from the foundry and wasted.

During the summer, the system permits dampering off the intake down-draft stacks just below the roof, and sucking through a side opening the pocket of stale hot air trapped below the roof solpes, using it for the compensating air curtains and thence to the atmosphere. This relieves the accumulated hot gases found beneath the roofs of foundry buildings on hot days, eliminating ventilators and also tends to cool the shop.

The unit was furnished by the Claude B. Schneible Co., Detroit.

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SMITH OIL & REFINING CO.
INDUSTRIAL OILS DIVISION . . . ROCKFORD, ILLINOIS

(*Continued from page* 218)

the other. Larger flasks may be rigged in this way, or may have holes in both halves, into which separate pins are inserted to locate the two parts of the flask with reference to each other. In this case the hole in the cope at one end is made oblong, as even steel flasks get out of shape from rough handling or other reasons. Stiffening ribs and brackets usually are provided to strengthen the flasks, and of course, the necessary lugs or rings to attach the crane hooks are needed for any flasks too large to be lifted by hand. Flasks of the largest sizes as a rule are made of a number of sections securely bolted together.

Metal flasks of the smaller sizes as a rule are so constructed that the copes fit fairly accurately on the drags. In the case of cast flasks, the tops and bottoms of the two parts are machined; in sheet metal ones, the flanges are made quite flat in the process of manufacture. Larger cast iron or cast steel flasks may also be machined, but rough handling at the shakeout and elsewhere often so damages the machined surfaces as to largely offset the advantage of following this practice.

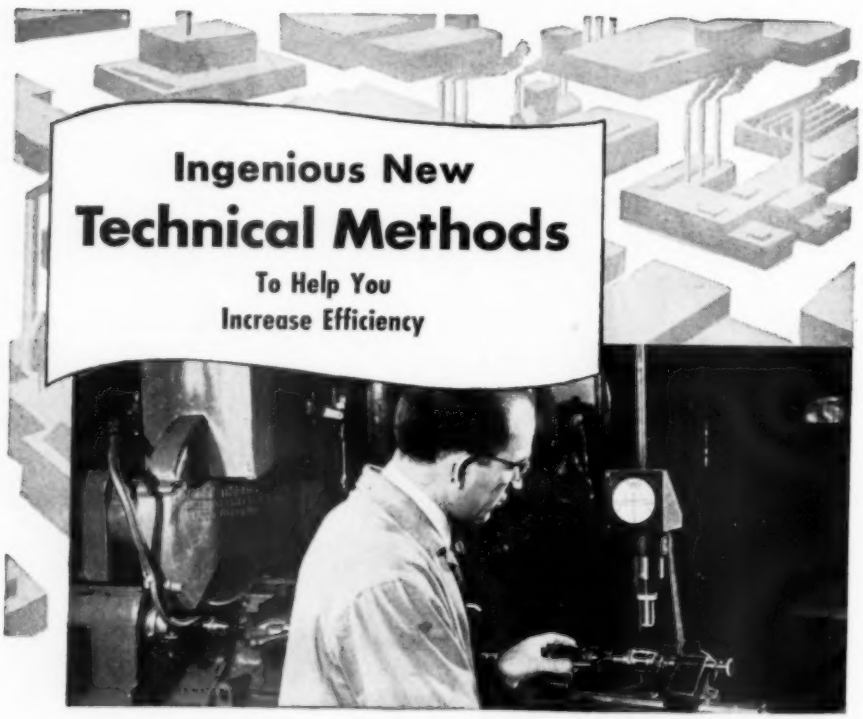
To ensure tight joints between cope and drag, when the flasks are not machined to a good fit, it is customary in setting the flask to insert liners about ⅛-in. or ¼-in. thick between the pattern board and the flange of the flask. The sand then extends slightly below the flask, so that when the mold is put together, the joint is between the drag sand and the cope sand, and the sections of flask do not quite meet. When copes are rammed on the drags, instead of on separate boards, the same result is secured by setting liners between the two parts of the flask.

Pattern Lifts With Cope

When the cope is lifted off the drag, the upper part of the pattern lifts off with it, being kept in position, in the case of light work, by the friction between sand and pattern. Heavier pieces are often supported by rods screwed into the top of the pattern, extending through the sand of the cope, and terminating in rings. Bars are passed through these rings and wedges driven between the ends of the bars and the flask, so that the pattern is firmly supported while the cope is being lifted. Finally, the two pieces of pattern are rapped to loosen them from the rammed sand, and are lifted out, leaving a completed mold, which is later assembled by rolling the cope over again and re-setting it on the drag. In thus closing the mold, the flask pins guide the two parts of the mold into the same relative positions that they occupied when the pattern was in place, so that the impressions in the sand of cope and drag meet each other properly.

If the two parts of the mold do not register correctly when closed, the upper part of the casting will be offset with reference to the lower part, or as foundrymen say, the mold is "shifted." If the flask pins fitted their holes with the very small tolerances usual in machine shop practice, the shift would be a matter of only thousandths of an inch. In foundry work, however, looser fits must be used in order to allow the molds to be closed quickly, and some slight shift is therefore inevitable. How much may be permitted depends upon the character and size of the castings being made. For very small pieces that must be quite close to pattern size, and that are rammed up in metal flasks, the pin clearance may be of the order of 1/100-in. On somewhat larger flasks, 1/64-in. is more usual, and for really large ones

(*Continued on page* 222)



Light Projector Increases Thread Grinding Production

Production of thread grinding machines can now be increased through the use of a light projecting device called the Thread Pick-up Projector. The thread profile appears in a viewing screen, magnified 20 times, thereby permitting accurate visual adjustments.

In operation the Thread Pick-up Projector is placed alongside the thread grinding machine. A Dalzen Thread Grinder, Model No. 1, is shown above. While the machine is grinding the thread, the operator, using the Light Pick-up Projector, adjusts a "dog" on the next piece to be ground. When the "dog" and piece are then placed in the thread grinder the thread profile is automatically in location and ready for grinding immediately.

Even the most inexperienced personnel can "pick up the thread" using this instrument after only a few minutes demonstration. Grinding is also done more accurately and the viewer permits measurements of reliefs, notches, etc. to .0005 inch.

Efficiency of production can also be increased through the use of chewing gum. The act of chewing helps relieve nervous tension and seems to make the work go easier and faster. For these reasons, Wrigley's Spearmint Chewing Gum is being made available more and more by plant owners everywhere.

Complete details may be obtained from
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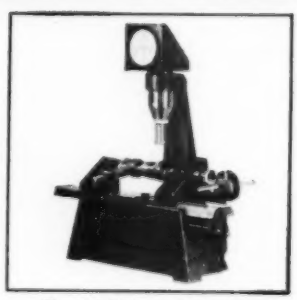
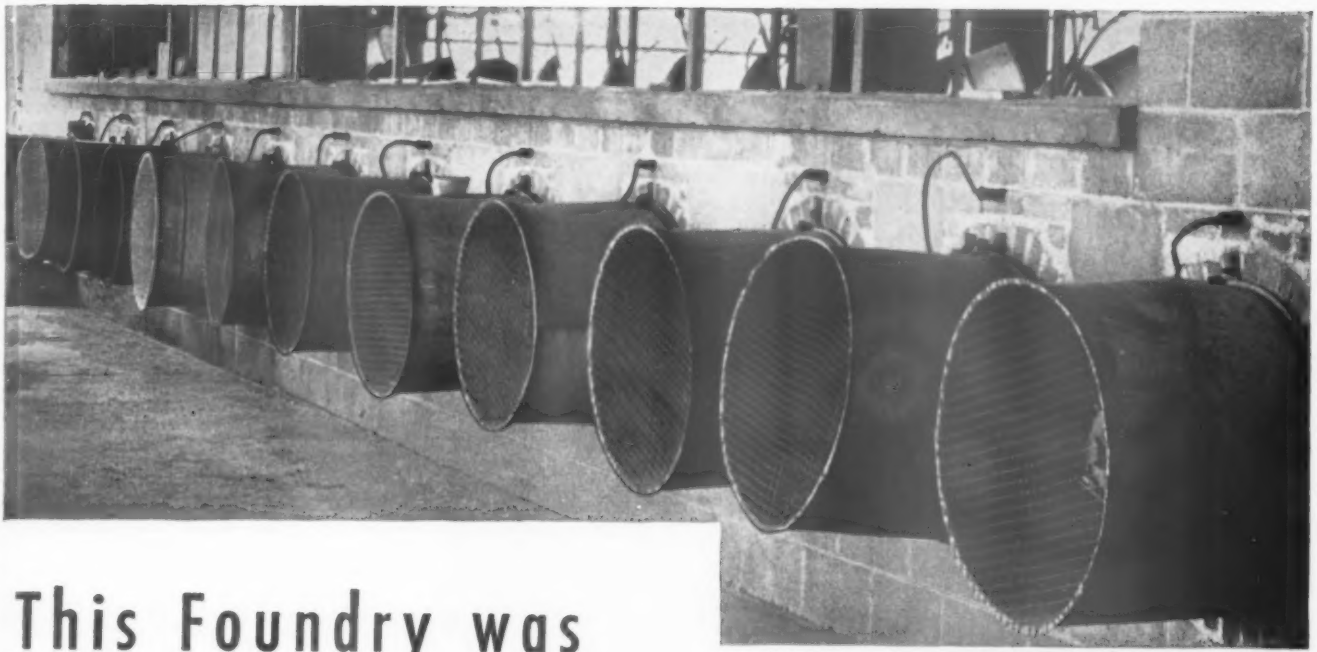


Thread Pick-up Projector

AC-75



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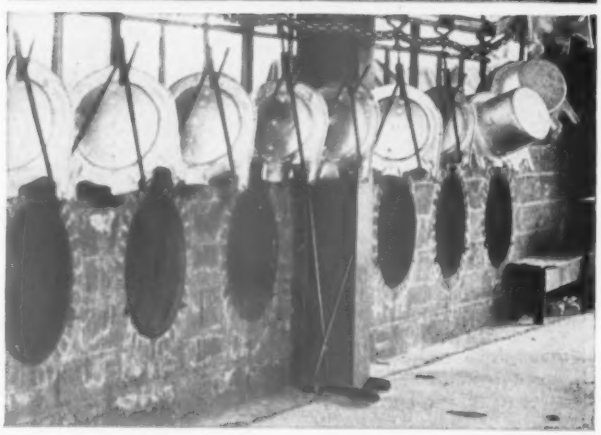

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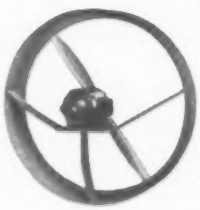

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(*Continued from page* 220)
at least 1/16-in. is required.

In making small castings, the light metal flasks used are generally stored under cover and the pins and pin holes are lubricated with flake graphite. Under these conditions, maintenance of proper pin fits is comparatively easy, since wear of pins and pin holes and distortion of the flasks are the only things to alter the fit. Equipment of this type is usually handled carefully enough to avoid damage to the flasks, and pin wear is not rapid. Larger flasks, however, are quite often, if not always, stored out of doors, and are sometimes exposed to the weather for fairly long periods.

Bushings welded into the flasks are more often used for equipment of this type than drilled holes, and if they are badly rusted, new ones are put in their place. Normally, however, it is not too easy to maintain good pin fits under these conditions, and the foundryman often resorts to other means of preventing shifts, rather than seeing to it that pins and bushings are correctly located and of the right size. These devices are more often adopted when mounted patterns are used than for hand molding, and will be described in the paragraphs dealing with that type of pattern equipment.

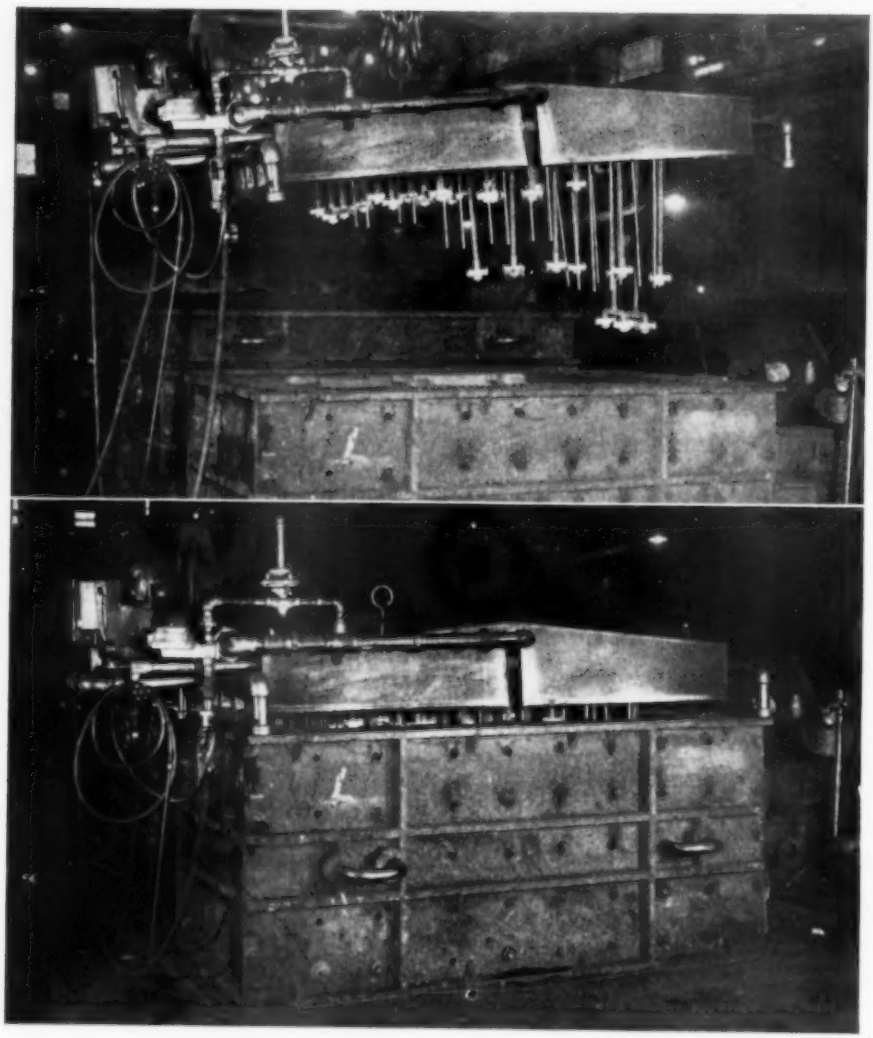
In foundries making small castings on molding machines of the squeeze or jolt type, flasks are widely used that are removed from the completed mold after the cope has been set on the drag. These are known as taper, strip or snap flasks, and their use will be more fully described in the pages devoted to machine molding. In these shops, many orders will be received for light castings, in lots too small to justify the expense of mounting the patterns for machine molding. These jobs are then molded on benches and are often made up in flasks of the same type as those used on the machines. As a rule, these flasks have pin arrangements that ensure good registery of the cope on the drag, while the flask is in place. When the flask has been taken off the mold, however, there is frequently no means of preventing the cope from sliding on the drag unless carefully handled, and it is in conveying the mold to the pouring floor and handling it there that shifts are likely to occur.

Find Use For Follow Board

If the casting has one flat side, of course, a one-piece pattern may be all that is required, and the cope may be rammed against the flat side. On lifting the cope the entire pattern is left in the drag, and is drawn from the sand just as the bottom half of a two-piece pattern would be. In some instances, only part of this face of the pattern is flat, the rest forming a surface of irregular outline lying at a lower level than that of the flat portion. When the sand has been rammed around a pattern of this type, the drag rolled over and the bottom board removed, the molder may have to cut away loose sand lying over parts of the pattern, and form a suitable parting at the points lying below the joint of the mold. The cope is then rammed in the usual fashion, with bars extending below the parting line to hold up the sand. If a number of castings are to be made from a pattern of this type, it usually pays to use a follow board with it, such as will be described in succeeding paragraphs.

(*Continued on page* 224)

Gas Burners Speed Drying of Large Molds



REDUCTION of mold drying time from overnight (10 to 12 hours) to a 20-minute to one-hour period for the same molds has proved to be an important factor in successful production molding of 1000-2000 pound castings at the Allis-Chalmers Mfg. Co., Milwaukee. Castings of this size or larger are required in sizable quantities on such parts as transmission cases for crawler tractors.

Radiant heat gas burners are offering this and several other advantages in the Allis-Chalmers operation. Not the least of these is the skin drying to a depth of 1 to 1¼ in. Shakeout time is substantially reduced and less time required in the sand system to break down lumps, such as result from complete drying of molds.

The portable gas burners save extensive handling in the huge Allis-Chalmers foundry, too. Since they can be set up in a position most convenient to subsequent operations, the long crane trips required for conveying molds to and from stationary ovens are avoided. The bottom view shows the burners in the closed position over the mold.

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THE FOOL-PROOF PIN

THE FREMONT FLASK CO.
Fremont, Ohio

(*Continued from page* 222)

Instead of having one face flat or nearly so, the casting may be actually hollowed on one side, like a shallow basin. To make such a piece, what is known as a "shell" pattern is often used. This is a more or less complete reproduction of the casting to be made, the pattern being shaped to the correct outline on both top and bottom. In use, the pattern is laid on a board, convex side up, and the drag is rammed against it in the same way as when using a solid pattern. To stand up against the ramming, of course, the pattern must be fairly thick and strong though by supporting it with suitable blocks attached to the board, the necessary support may be given to a thin-walled piece.

When the drag is completed and the bottom board or grid clamped on, the flask, pattern and pattern board are clamped together and rolled over, and the latter removed. The cope is then rammed against the hollow side of the pattern. Much of the sand in the cope will extend considerably below the line of the joint between the drag and cope flasks, and obviously would not remain in place unless special means were taken to give it support. For this purpose, as previously described, the cope bars are shaped so as to reach down into the hollow side of the pattern, and gaggers, carefully set, serve to support the hanging mass of sand and keep it in place.

In many cases, it is not possible to make a casting with a two-piece pattern, and draw one half out of the drag and one out of the cope. Many pieces are so shaped that the pattern required to mold them has to be made in several parts, and instead of merely a drag and a cope, one or more extra sections of flask are required. These pieces are known as cheeks and are made up much as copes would be, by setting the intermediate section of the pattern on the bottom piece, after the drag has been rammed up and rolled over, and placing a cheek-flask over the drag flask. In that case, of course, a parting has to be made at both the top and the bottom surface of the sand in the cheek.

Place Jet Bars In Cheek

To support this sand when the cheek is lifted, bars called "jets" are usually fastened into the cheek flask, extending from the outside frame to within a few inches of the pattern. Except that they do not extend completely across the section of flask used as a cheek, these jets do not differ from the bars in a cope, and of course their function is exactly the same as that of cope bars. If necessary, gaggers may be used with them to give the sand additonal support, but they must be short, so as not to extend through the top of the sand in the cheek section. An example of the use of a cheek flask is given in Fig. 4, which shows a pattern in place and the first of several cheek flask sections set on the drag, ready for ramming.

When the sand in the cheek has been leveled off and smoothed down with the trowel, the top piece of the pattern is put in position, parting sand is sprinkled over the joint, and a cope flask is set on the cheek flask. The cope is then rammed up and lifted off in the ordinary manner, and the cheek is raised off the drag, bringing the intermediate part of the pattern with it. This portion of the pattern may be drawn from one end of the cheek flask; in some cases, however, where the middle part of this piece is smaller than the ends, so that it is double-drafted, it may be drawn in both directions, by making it in two parts, doweled together.

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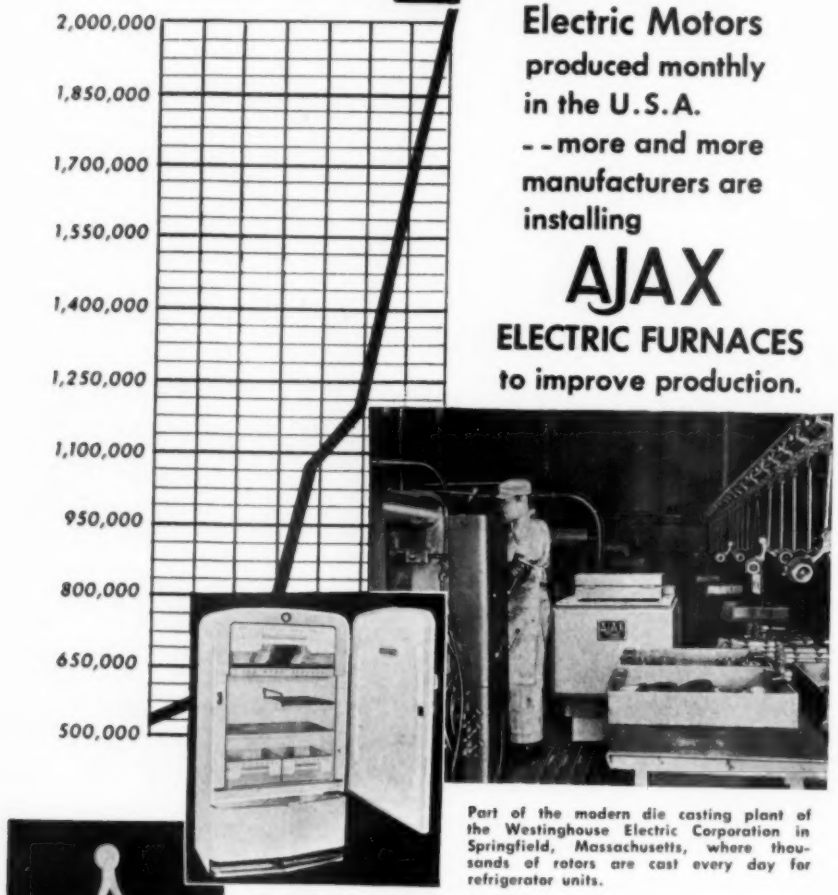

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It is only in the case of cheeks, of course, that are open at each end, that this device can be resorted to. Quite often it is necessary to resort to the use of cheek flasks in order to make a mold from a complicated pattern, and sometimes one cheek flask will not suffice, and two or more must be provided.

Parts such as bosses, protruding from the sides of the casting, which will not draw out of the mold, are often formed by using loose pieces of pattern. These are set in their proper place on the main pattern when the sand has been rammed up to the point where they should be located, and the sand is carefully packed around them. They are not fastened permanently to the rest of the pattern, so that they do not move with it, but remain in the sand when the pattern is drawn, and are taken out separately. They are, of course, so shaped that in moving them in a direction parallel to their length, they will come out of the sand; in foundry language, they are not in themselves "back-drafted". If they were, it would be necessary to form the desired projections by means of cores and core prints, as will be described a little further on.

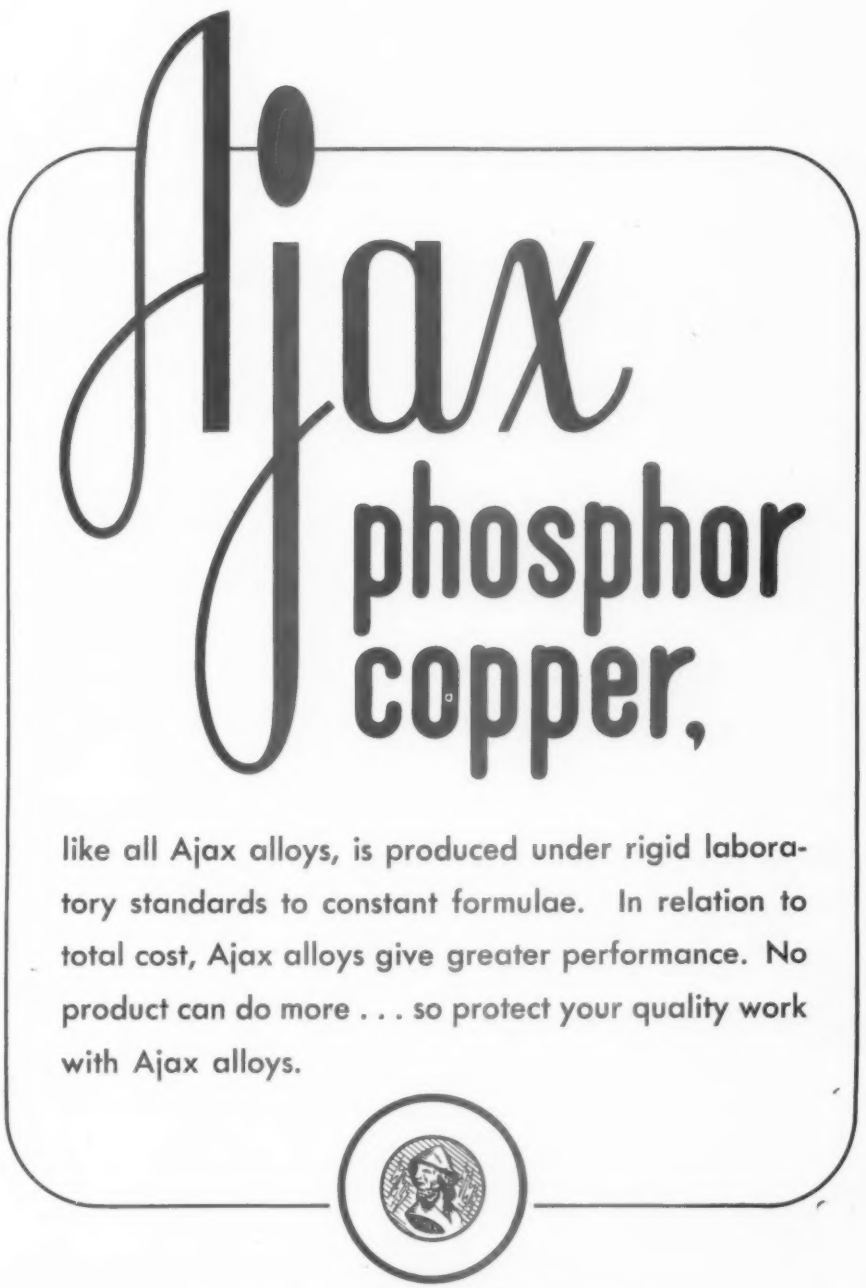
Use a Half Pattern

Molds ordinarily made with a two-piece split pattern, may be molded with a one-piece pattern, by either of two methods, known respectively as "bedding in" and "using a false cope". These methods are applied mostly in making comparatively large and heavy jobs, but are also used to some extent for smaller castings when it is not worth while to change the pattern received from the customer because of the small size of the order. In bedding in, the drag part of the mold is made in the position in which it is to be used, and is not rolled over. The pattern is suspended in the flask in the proper position, and the sand is compacted against a bottom board and under the pattern, much of the ramming naturally being in a horizontal direction.

Frequently a good deal of the sand directly below the pattern is placed and rammed before the latter is set, and in extreme cases, where the piece being made is flat or nearly flat on one side, all or most of the sand may be rammed first, and the pattern set on it and pressed down until it is firmly seated. The method of setting a pattern in place in the flask for bedding in is illustrated in Fig. 7, which shows the bottom portion of the pattern for a centrifugal pump casing, ready to complete the ramming of the drag sand.

If the casting has one flat side, however, it will sometimes be found desirable to mold the job with the complicated side down, and thus be able to use a cope with a plain flat surface. In numerous cases, in deciding which side of the piece shall be molded in the cope and which in the drag, the foundryman must be guided by the fact that loose sand in a mold tends to float on the steel, and since there must always be a certain amount of loose sand, the side cast down is usually sounder and freer from defects than that cast up. The use to which the casting is to be put may require that one side at least be absolutely sound, and that side naturally should be at the bottom of the mold. The relative thickness of the different parts of the casting, too, as will be explained in detail in a later chapter, may also be the determining factor in deciding which side of the piece should be uppermost.

The sand in the drag part of the mold may be brought up to the level of the edge of the flask and smoothed down flat, as it would be in the case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of a drag rammed on a board with a split pattern. Frequently, however, the outline of the piece is such that if the mold were so made, portions of the pattern would not lift properly, because they would be covered with sand—that is, these parts taper in the wrong direction, so that they are "back-drafted." In this case, the sand is brought up to such a level that no part of the pattern will fail to lift clear of the mold. The surface of the sand in the drag may then have a very uneven outline, and the molder making this parting, as it is called, follows the shape of the piece so as to have no back-draft, which permits the pattern to lift cleanly out of the drag, and the cope similarly clear the pattern. A typical case is shown in Fig. 12, a view of the completed drag and the pattern that was used to make it.

When the drag is finished to the proper level, a cope flask is placed on it, rammed with sand and lifted off as in rollover molding. If the pattern is made in one piece, as is usually the case, it of course does not come up with the cope, but remains in the drag. To avoid damaging the sand in the cope, it is necessary in making this lift to raise the cope straight up, and to be sure that one side of the flask does not start to move before the other. When the cope has been removed and set down, the pattern is rapped and lifted out of the drag.

Though in most cases patterns that are intended for bedding-in are made in one piece, it is occasionally desirable to have some portions of them separate, so that they lift with the cope. If these pieces are too heavy to remain in the sand by friction alone, they must be held up with ring-bolts and wedges like the top part of a heavy two-piece pattern.

Though small patterns are often bedded in when only a few castings are to be made from them, the method is used mostly for large jobs. In such work, drag flasks are often dispensed with, and the pattern simply set in a pit in the foundry floor. Such pits are usually lined with heavy plates or lumber, held together with tie rods, so that the mold will not be burst by the pressure of the fluid steel. The bottom may also be plated, and in any case cross members known as binders are usually set in the bottom, and tie rods anchored to them are used to hold down the cope flask or flasks.

These pits are sometimes of very large size, such as that shown in Fig. 11, and the one with a block pattern in place ready to ram up, in Fig. 10. The completed drag mold for a turbine casing, Fig. 9, is another typical example. The operation of molding a large ship casting by bedding in a suspended pattern, is well illustrated in Fig. 8. This view shows the device used to hold up the pattern and level it, the extemporized bracing to support the sand in the lower part of the mold, and the men ramming the sand beneath the pattern. The helper in the foreground is about to throw a shovel-full of sand to the man on the pattern, who holds a riddle ready to catch it.

(To be continued next month)

Sources of Illustrations

Figs. 1 and 7—General Steel Castings Co.
Figs. 4 and 9—Bethlehem Steel Co.
Figs. 6 and 12—Birdsboro Steel Foundry & Machine Co.
Fig. 8—Columbia Steel Casting Co.
Figs. 10 and 11—United Engineering & Foundry Co.

Gray Iron Founders' Society Inc. has moved into its newly furnished suite of offices in the National City Bank Bldg., Sixth and Euclid Ave., Cleveland 14. The society formerly was located in the Public Square Building, Cleveland.

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INDUSTRY *Briefs*

BUFFALO Stainless Casting Corp. has begun production in the former Otis Elevator plant, 777 Northland Ave., Buffalo. Capitalized at $750,000, the new company acquired the Otis property in March. Recent production has been about 25 tons of castings per month; however, the company's goal is 200 tons per month. Castings are being produced for chemical pumps, jet engines, dairy equipment and high pressure steam turbines. Donald M. Scott is president.

* * *

National Roll & Foundry Co., Avonmore, Pa., manufacturers of iron and alloy iron rolls and castings, has completed a modernization program, including an addition to the roll shop and installation of new roll lathes. Officers of the foundry company, which has been in operation for 40 years, include W. H. Seaman, president; Warren W. York, board chairman, and Robert Logie, treasurer.

* * *

Lee & Daniel, Pasadena, Calif., has been formed to engage in a general foundry and metal manufacturing business. Principals are William J. Donahue and M. C. Bernard of Pasadena, and B. L. Pedder of Altadena, Calif. The corporation is represented by Riccardi, Webster & Donahue, First Trust Bldg., Pasedena.

* * *

Globe Valve Corp., Delphi, Ind., is completing a new foundry building which will house the entire foundry operation. The addition will permit expansion of finishing and polishing operations in the space now occupied by the foundry.

* * *

Fire which caused estimated damage of $175,000, swept the plant of Forrest Mfg. Co., San Gabriel, Calif., Oct. 5, and almost completely destroyed the chrome plating shop. The blaze gutted the plumbing equipment plant, at 409 South San Gabriel Blvd., and ruined costly machinery and supplies. The company, headed by Henry Forrest, makes brass valves and other plumbing equipment.

* * *

Moskowitz-Rose Syndicate, Cincinnati, has acquired control of Standard Gas Equipment Corp., Bayard and Hamburg Sts., Baltimore 30, manufacturer of commercial and domestic gas stoves, ranges and ovens, and Standard's subsidiary, Alabama Foundry Co., 3925 North 29th St., Birmingham 7. Management and personnel of Standard company are retained without change.

* * *

Central Scientific Co., 1700 Irving Park Rd., Chicago 13, manufacturer and distributor of scientific instruments, laboratory apparatus and laboratory supplies, has been purchased by Cenco Corp. E. Perry Holder, New York, is president of Cenco. Caryl W. Dempsey continues as president of Central Scientific Co.; no other changes in personnel are contemplated.

* * *

King Machine Tool Division of American Steel Foundries, Paddock Rd. and Tennessee Ave., Cincinnati, has started an $800,000 building program which includes an addition to the production plant, a castings cleaning building, office structure and pattern storage unit.

* * *

Permanente Metals Corp., Spokane, has completed the new Kaiser Aluminum Research Laboratory in a new building adjacent to its Trentwood rolling mill in Spokane. The two-story building will house nine separate laboratories, the department offices and a technical library.

* * *

Foxboro Co., 32 Neponset Ave., Foxboro, Mass., has completed construction of a new building for its Houston branch at 2518 South Blvd., Houston 6, Tex. The branch, under the direction of Leo W. Parten, formerly was located at the Sterling building.

* * *

Maynard Electric Steel Casting Co., 2856 South 27th St., Milwaukee 7, has purchased from Cardinal Stritch College, Milwaukee, a large vacant tract of land at South 35th St. and West Oklahoma Ave. No plans for use of the property were revealed.

* * *

Pettibone Mulliken Corp., 4710 West Division St., Chicago 51, has purchased the Universal Engineering Corp., 625 C Ave. N. W., Cedar Rapids, Iowa, manufacturer of crushing, screening, washing and loading equipment for stone and gravel.

* * *

Amoskeag Steel Corp., 7 Bedford St., Manchester, N. H., has started production of steel castings, with planned output of 8 tons daily. Carl S. Nute is president and Joseph Prendergast is vice president and general manager in charge of operations.

* * *

Adelson-Wirts Inc., 1800 Park St., Hartford, Conn., has been appointed an authorized dealer by Air Reduction Sales Co., New York. It will carry a complete line of welding and cutting gases, apparatus and supplies, arc welders and carbide.

* * *

Wright Foundry & Mfg. Co., Kendallville, Ind., recently constructed, now is producing gray iron castings. The firm is owned and operated by R. A. Wright, president, and his son Donald Wright, vice president.

* * *

McArdle Equipment Co., 5724 Navigation Blvd., Houston, Tex., has been appointed district representative in the states of Louisiana and Texas for Foundry Equipment Co., in Cleveland, manufacturer of mold and core ovens.

* * *

Airco Export Corp., 33 West 42nd St., New York, has changed its name to Airco Corp., (International), effective Oct. 1. Airco is a subsidiary of Air Reduction Co., New York.

* * *

Die Cast & Moulded Products Co., 11627 South Main St., Los Angeles, has obtained building permit for construction of a new 40 x 100-ft factory at that address.

* * *

Harr-Vinn Foundry Co., 625-631 Portland St., Baltimore, Md., manufacturer of decorative brass ware, has changed its name to Harrin Co. Albert N. Meyer is president.

* * *

Yorktown Foundry Co., Yorktown, Ind., has added to its facilities a complete pattern shop which is equipped to handle its own pattern work as well as job patternmaking.

* * *

Central Aluminum & Brass Foundry, LaGrange, Mo., recently organized by Henry and Pete Brandt and Ted Sturhan, is now in operation.

* * *

American Foundry, 7001 Telegraph Rd. (P. O. Box 226, Sta. A), Los Angeles, has obtained permit for a 2400 sq ft building addition.

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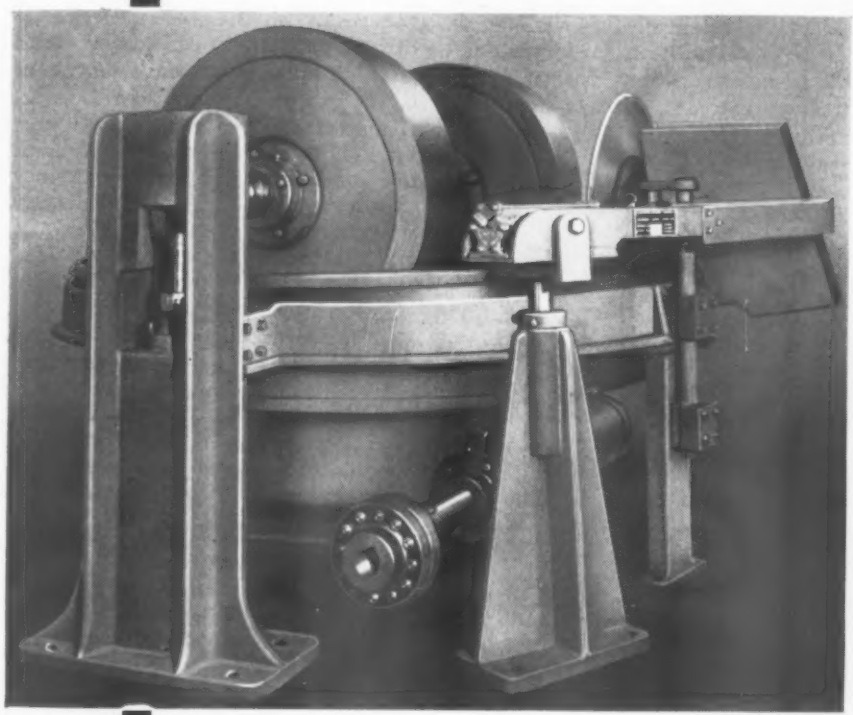


it's the

Clearfield 930 mixer

For either batch or continuous preparation of large quantities of sand, the 930 Clearfield Mixer provides outstanding service. With a capacity of 30 to 40 cubic feet per charge it will turn out large quantities of excellently prepared sand with remarkable economy.

Write today for Catalog No. 79 for complete details.

CLEARFIELD MIXER
MIXES, TEMPERS, AERATES

CLEARFIELD MACHINE COMPANY
CLEARFIELD
PENNSYLVANIA, U. S. A.

HIGH SILICON CAST IRONS RESIST HIGH TEMPERATURES

(*Continued from page* 69)

(*A*) that has not been subjected to cyclic heating is shown for comparison. Fig. 1 shows not only that the high-silicon cast iron bars are more resistant to growth than the ordinary cast iron bar, but also that an addition of approximately 1.25 per cent copper and 0.50 per cent chromium renders the high-silicon cast iron extremely resistant to scaling. Patent applications have been filed to cover this subject matter.

The growth resistance of high-silicon cast irons has been attributed to the high critical temperature (Ac_1) of this material. Fig. 4 shows the curve for Ac_1 temperature vs silicon content of high-silicon cast iron. For comparison, the Ac_1 temperature of ordinary gray cast iron is approximately 1400°F.

The effect of critical temperature upon the growth characteristics of cast iron is clearly shown by the results of additional growth tests summarized in Fig. 5. Cyclic heating to 1300°F, which is below the critical temperature for both high-silicon and ordinary cast iron, caused only primary growth, after which no further growth occurred. Primary growth is the result of the decomposition of carbide particles in the cast iron and is equal to the difference in volume of the carbide particles and their decomposition products, graphite and ferrite. Since high-silicon cast irons are almost fully ferritic as cast, they are subject to little or no primary growth. Cyclic heating to 1500°F, which is above the critical temperature for ordinary gray cast iron but below the critical temperature for the high-silicon cast iron, caused growth in only the ordinary cast iron. Cyclic heating to 1845°F, which is above the critical temperature for both types of cast iron, resulted in growth in both the high-silicon and ordinary cast iron.

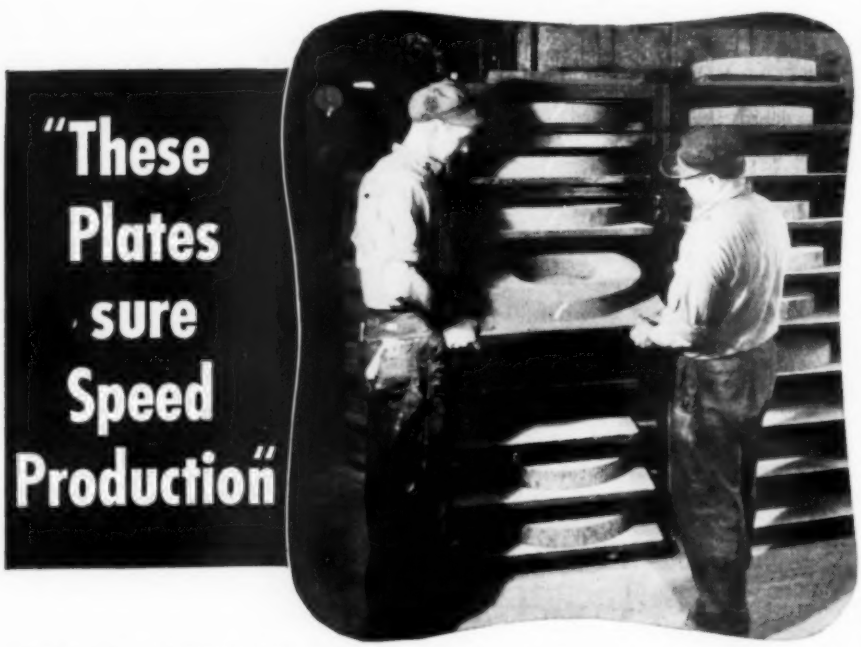
Melt High Silicon Iron

High-silicon iron castings can readily be made in the average gray iron foundry since the iron can be melted in either a cupola or an electric furnace. In cupola melting it is necessary to use a charge containing approximately 0.50 per cent more silicon than desired in the final product and with as low a carbon content as practical. The high silicon content in the charge is obtainable from silvery pig iron. Melting should be as fast as possible, and after melting, the metal should be tapped from the hearth as soon as possible to avoid excessive carbon pickup.

Cast iron with the growth and scaling resistance exhibited by the high-silicon iron alloyed with copper and chromium should have many useful applications for parts used at elevated temperatures. Some possible applications for this iron are parts for cook stoves, heating stoves, home furnaces, melting pots, gas or oil burners, heat treating containers of various types, and a wide variety of industrial equipment.

It is hoped that the present work will provide some answers to questions which foundrymen and metallurgists have been asking. Continued research and trials by industry will provide more information. High-silicon iron may become an important item among the heat-resisting metals available to the engineer.

The authors wish to express their appreciation for the assistance given them by Dr. C. H. Lorig, assistant director of Battelle Memorial Institute, under whose supervision this research was conducted.



TRANSITE CORE PLATES are lighter, stronger, resist warpage

Core makers can handle more Transite* Core Plates at one time, thus make fewer trips. That means faster production with less fatigue and fewer accidents. Transite Core Plates offer all these advantages:

They Last Longer—Made of fibrous asbestos and cement, Transite Core Plates resist shock . . . are less likely to crack or break.

They Clean Easily—Core wash, sand, etc., do not stick as readily as to other materials. Both sides are usable.

They resist Corrosion and Warpage—Transite Core Plate surfaces stay smooth even after long service. Warpage is less than 0.1%.

They are Economical—Low price, low maintenance and long life add up to low cost.

To eliminate green cores and reduce baking time perforated core plates are also available.

For full details, write Johns-Manville, Box 290, New York 16, N. Y.

JM PRODUCTS

* Reg. U. S. Pat. Off.

Johns-Manville TRANSITE CORE PLATES MADE OF ASBESTOS

Now You Can

PAGE 159

Dictionary of Synonyms

STOP
ELIMINATE
DISCONTINUE
PUT AN END TO
CEASE

SHOVELING For Sand Preparation

because the new

ROYER

SAND CONDITIONER IS *SELF-LOADING SELF-PROPELLED*

There are many ways to say it—but it all adds up to this—sand shoveling is *out, through, done for* in modern foundries equipped with the new ROYER SAND CONDITIONER! The new ROYER does a complete job of sand preparation . . . moves into the pile on its own power . . . scoops sand off the floor . . . mixes sand and binder, breaks up lumps, culls out burnt cores and other trash, aerates and de-gasses sand and piles it for storage or immediate use. Up to 50 tons per hour of finest grade molding sand. *A sensational cost-cutter.*

Let us send you full details about this revolutionary new Self-Loading Sand Conditioner. Write us today.

ROYER

FOREMOST IN SAND CONDITIONING EQUIPMENT

ROYER FOUNDRY & MACHINE CO.

159 PRINGLE ST., KINGSTON, PA.

NEW Equipment AND Supplies

(1)—Skid Box: Phillips Mine & Mill Supply Co., 2227 Jane St., Pittsburgh 3 — Heavy corrugated steel skid box with double reinforced corner angle construction has rolled edge top and cast and forged steel latches. Formed channel legs offer floor protection. The box may be used with lift trucks or cranes and can be made to fit any size specifications. It is available with various types of discharge doors.

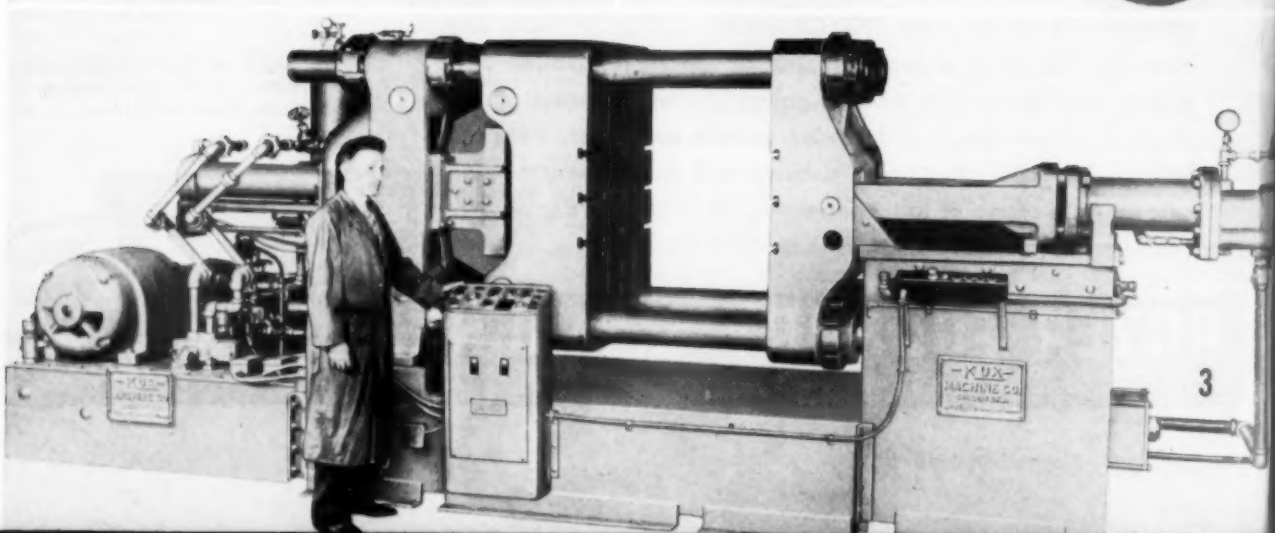
(2)—Power Wheelbarrow: Kwik-Mix Co., 126 Milwaukee St., Port Washington, Wis. — Power wheelbarrow is designed to handle wet or dry aggregates and materials. Powered through V-belt drive and enclosed gears from an air-cooled 3.9 hp gasoline engine, the unit has a rated capacity of 10 cu ft or approximately 1000 lb. It is equipped with finger-tip control of speeds from 2 to 4 mph both forward and reverse. Features include a gravity dump body with chain stop designed to assure a clean dump every time; a steering device that turns the machine in its own length; a maximum width of 33 in. and a differential on the front axle. Unit has two rubber-tired drive wheels and a single rubber-tired steering wheel.

(3)—Die Casting: Kux Machine Co., 3940 West Harrison St., Chicago—Large die casting machine having 800 tons locking pressure and injection pressures reaching 40,000 psi is designed to form castings in zinc weighing up to 30 lb and in aluminum weighing up to 10 lb. Die space is 25 x 40 in. between the tie bars and 17½ in. of die separation. Large dies can be accommodated and castings having a deep draw can be produced. Completely hydraulically operated and electrically controlled, the machine is push-button operated. Operation speed is three to four zinc casting cycles or two aluminum casting cycles per minute. It has a gooseneck plunger mechanism for zinc castings and a cold chamber hand ladling unit for aluminum with conversion requiring a minimum of change-over time, it is claimed. Automatic casting ejection is a feature of the machine.

(4)—Dump Tractor: W. F. Hebard & Co., 336 West 37th St., Chicago 9—Dump tractor has a capacity of 1½ cu yd or 4000 lb. Heavy duty six cylinder engine of 56 bhp has a drawbar effort of 3000 lbs providing a towing capacity of 60 tons on dry level concrete. Tractor has four speeds forward ranging from

1

2



3

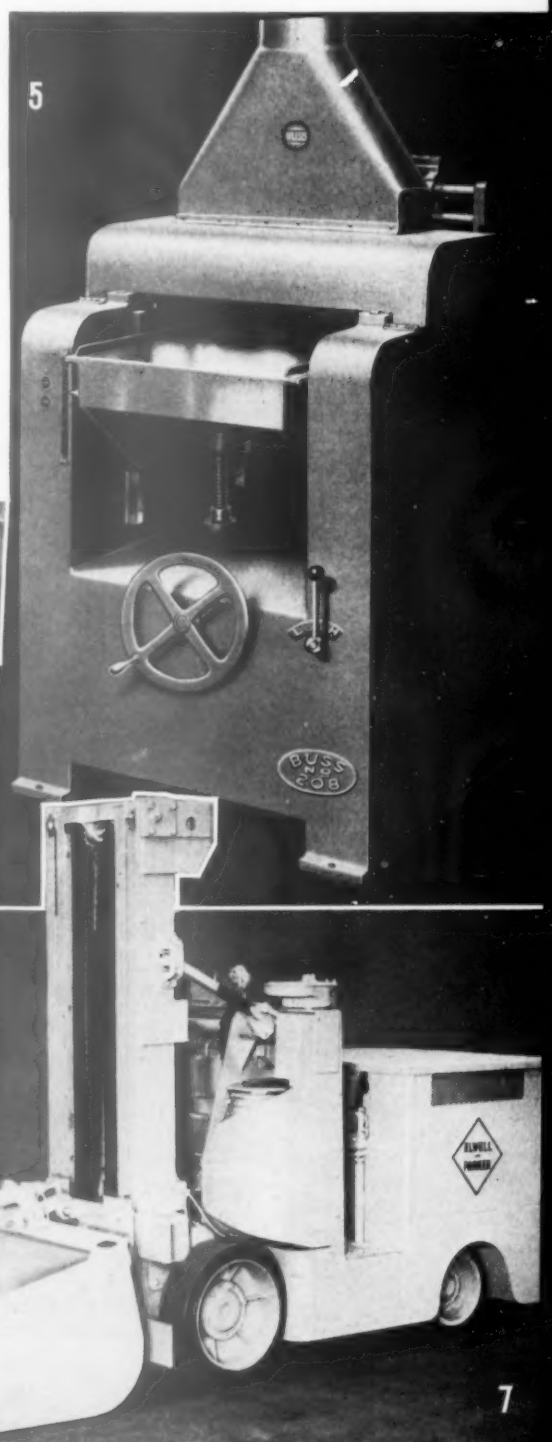
3 to 20 mph, and one reverse speed of 2½ mph. Chassis also is available with a stake platform 64 in. wide and 51 in. long with 4000 lb capacity. Optional equipment includes electric lights, snow plows, coupler for front, rotary sweeper broom and different tires.

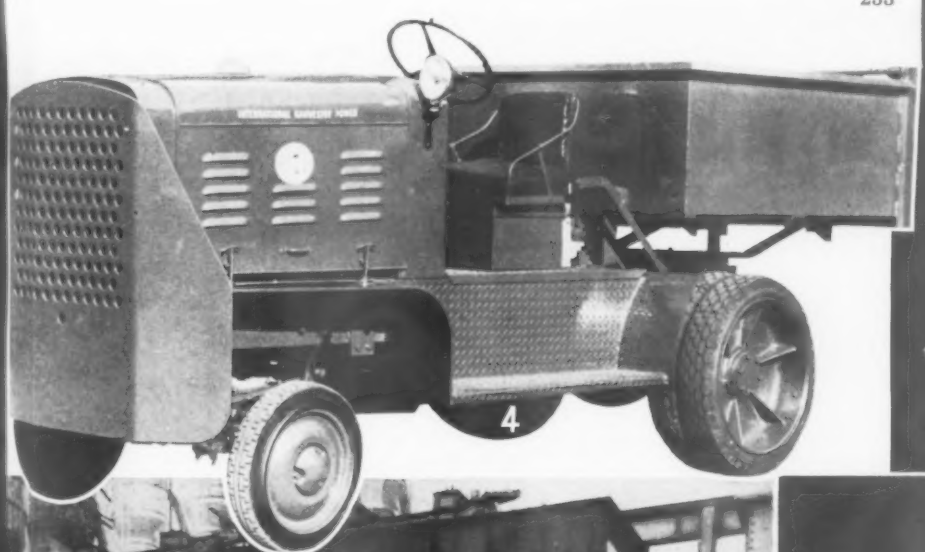
(5)—Wood Planer: Buss Machine Works, 201 West Eighth St., Holland, Mich.—Single head surfacer will handle stock 20-in. wide and 8-in. thick. It is equipped with four driven rolls, and the top infeed roll and chipbreaker are sectional which permits feeding of several pieces of varying thickness simultaneously without danger of "kickback." Close adjustability, provided for by a built-in knife grinder-jointer attachment, is said to insure smooth, accurate planing. Motor and mechanism is fully enclosed and frame is one-piece welded steel. One-piece table built into the frame is 36 in. long and 20 in. wide between the continuous guides. Table block is supported with take-up gibs on two heavy elevating screws 1¼ in. diam. It is raised and lowered through bevel gears with a handwheel at front of the machine. Movement of the table up or down maintains the parallelism of the table with the cutterhead at all positions.

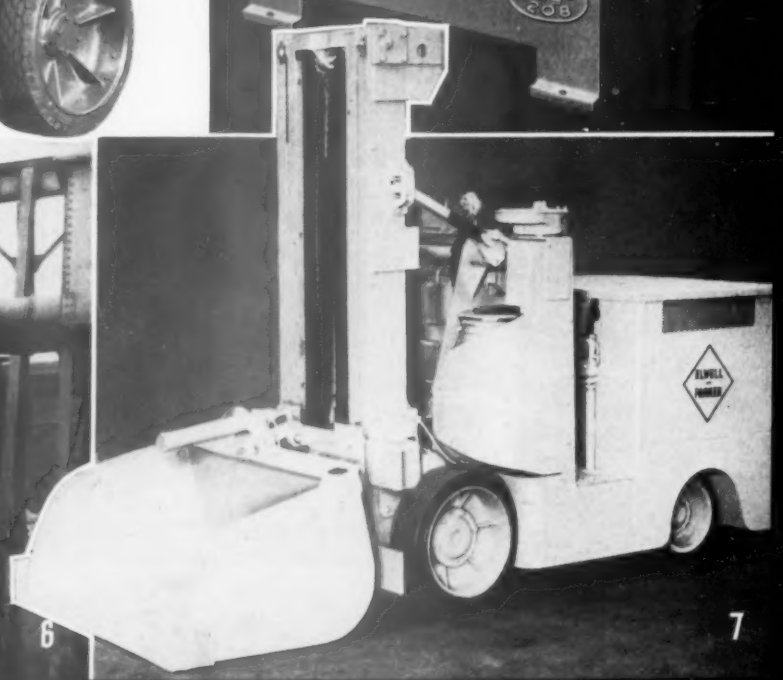
(6)—Dust Conveyor: Hapman Conveyors Inc., 2405 West McNichols, Detroit 21—Pipe-type dust conveyor to remove accumulated dry dust from collector hoppers employs dust-tight connections between the bottom of the hoppers and the carrying run of the conveyor pipe, preventing loss of dust and providing a self-sealing unit. The conveying system utilizes rubber flighted sealed pin chains. All round rubber flights in restricted pipe sections are designed to provide operation under varied pressure or vacuum conditions. The system, which eliminates dust hopper gates, can receive dust from a series of collector bins and convey and elevate any reasonable height or distance. One collection with a truck is ordinarily sufficient for one day's dust accumulation.

(7)—Scoop Attachment: Elwell-Parker Electric Co., 4205 St. Clair Ave., Cleveland—Special scoop, interchangeable with a standard type fork, is attached to the electric truck's tilting and elevating mechanism, and all controls are centralized at the driver's station. When the scoop is lowered to floor level it assumes its normal shoveling position; for adjustment to local conditions the truck's upright column may be tilted forward 5 degrees from perpendicular. For safe carrying of the load and to avoid spillage, the upright column may be tilted backward 15 degrees from perpendicular. Scoop may be emptied at floor level or at any height up to 117 in. Scoop capacity is 12 cu ft, 2000 lb, and truck speed with load ranges up to 5½ mph.

Temperature Controller: Thomas A. Edison Inc., Instrument Division, 51 Lakeside Ave., West Orange, N. J.—On-off type tempera-





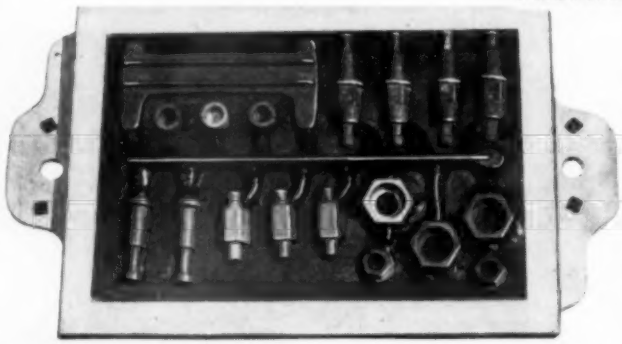


Loose and Metal Gated Patterns Converted into Profitable Jobs with

TAMASTONE

• By making the COMBINATION TAMASTONE PLATE shown here casting requirements were met in record time. The foundry was able to turn out a job considered impractical. By converting these pattern odds and ends into a Tamastone Match Plate the customer received his work on time and at a BIG SAVINGS over loose pattern production. Here is a case where the foundry was able to satisfy the customer on a "nuisance" job and do it PROFITABLY.

CHECK UP!
ARE YOU PASSING UP PROFITABLE JOBS?



Tamastone can help you solve many difficult problems. Help you speed production as much as 400%. Cut cost up to 75%.

Write Today!

TAMMS SILICA COMPANY, 228 N. La Salle St., Chicago 1 ,Ill.

BIGGER LOADS with *Sterling* HEAVY-DUTY TRUCK

Solves Your Casting Transport Problem!

This Sterling All-Steel, Heavy-Duty Truck is ideal for transporting castings from Wheelabrator, Roto Blast and similar equipment. Truck height is adjustable to discharge door. Big capacity cuts down number of loads required. Roller bearing wheel and ball bearing swivel casters increase maneuverability. Sturdy, reinforced, welded construction. Ask for Circular No. 52.

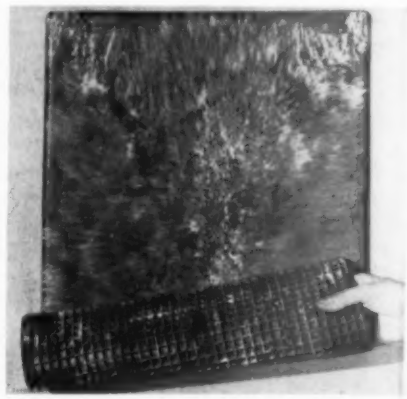
Sterling FOUNDRY EQUIPMENT

STERLING WHEELBARROW COMPANY • MILWAUKEE 14, WIS., U. S. A.

A 5398-⅓

ture controller uses a single electronic tube with an electrical resistance type bulb for thermal pick-up. Use of the resistance bulb is said to permit location of the sensing element at a point remote from the control panel and eliminates the necessity of thermal compensation. The nonindicating device may be used to control temperatures to close tolerances in solids, gases or liquids. Units are available to cover the temperature range from —100° F to 1200° F and are adjustable within a range of several hundred degrees. Supply voltage may be 115 or 230, 50-60c alternating current.

Rubber Mats: Colonial Rubber Co., Oakwood St., Ravenna, O.—Rubber mats for the relief of fatigue from standing are said to be nonmarking and nonskid. Constructed

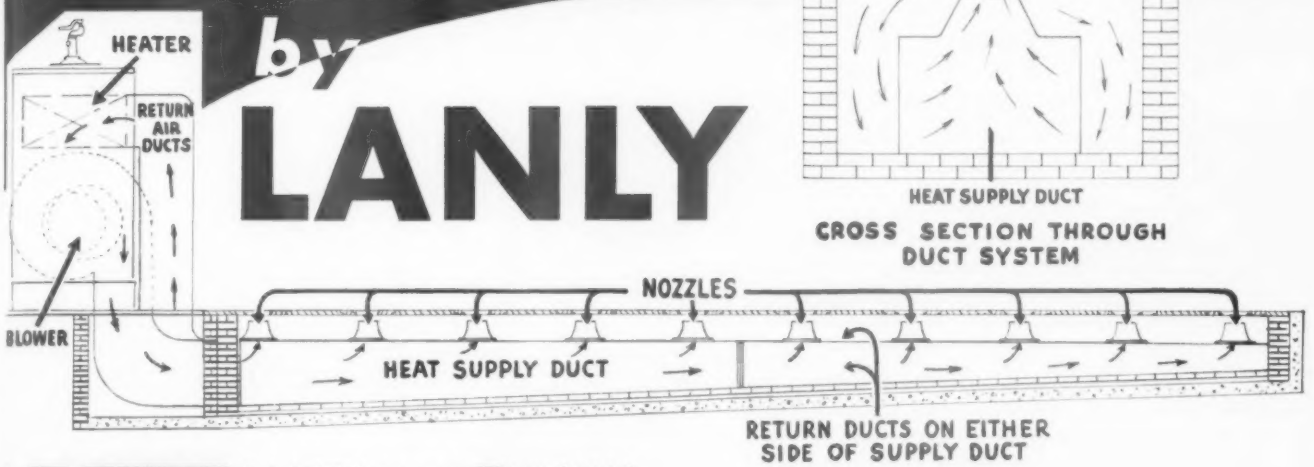


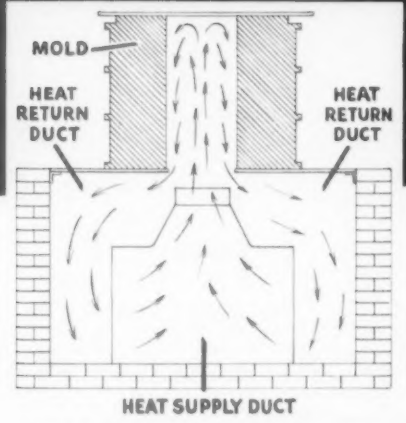
of more than 2000 small rubber cells criss-crossed with thin rubber strips to produce a "squeegee" action, the mat is designed to offer the proper resiliency to make standing pleasureable without any sensation of annoying softness. Mat is 16 x 23½ in., comes in blue and white, gray and white, red and white, green and white, burgundy and white, and solid slate gray, and is available in neoprene oil-resistant rubber. They may be cleaned with soap and water.

X-ray Machine: General Electric X-ray Corp., 4855 West McGeogh Ave., Milwaukee 14—Machine for x-ray diffraction in the identification and quantitative analysis of unknown materials may be used for three different purposes: Direct measurement of x-ray diffraction intensities through the use of a Geiger-Mueller counter in combination with a rate meter, scaler and chart recorder; a fluorescent x-ray spectrometer, employing a focusing crystal analyzer; and, with x-ray sensitive film, as a conventional x-ray diffraction unit.

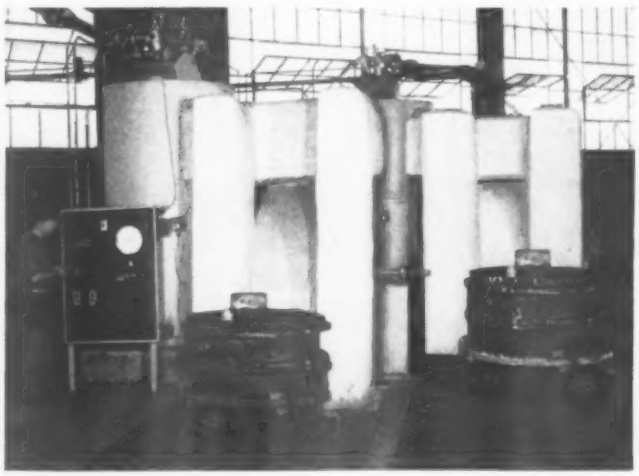
(*Continued on page* 236)

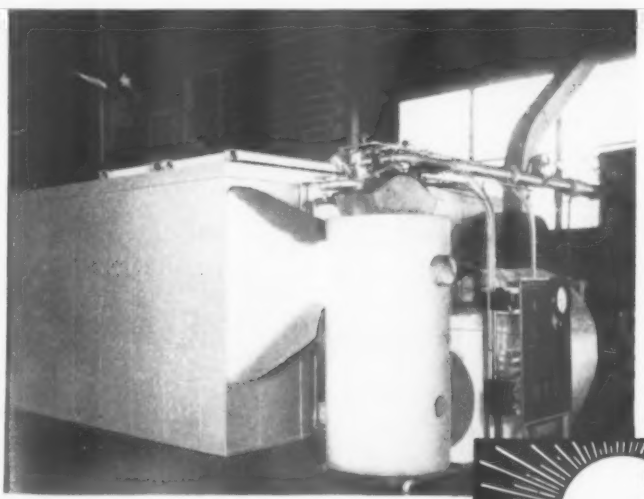
UNUSUAL INSTALLATIONS for UNCOMMON OPERATIONS by LANLY





CROSS SECTION THROUGH DUCT SYSTEM





These three installations for the Shenango-Penn Mold Co. give further evidence of LANLY competence as oven builders.

At the left are two mold drying benches. As illustrated above, heat is supplied through a main duct in an under floor tunnel. The heat passes through nozzles into molds placed on the metal floor directly above. Plates on top of the molds divert the heat downward into ducts which return it to the heater for reheating and recirculation.

The result is a smooth working, economical installation.

The oven illustrated at the lower left has sliding doors on top through which unusually long cores are lowered by an overhead crane.

All three systems are heated by Lanly versatile and highly efficient convection heaters.

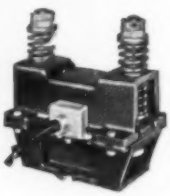
Literature is available describing LANLY standard ovens. Correspondence is invited regarding ovens for special purposes.

THE LANLY CO.
INDUSTRIAL OVENS

780 PROSPECT AVENUE • CLEVELAND 15, OHIO

SYNTRON
"Pulsating Magnet"

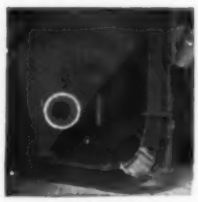
ELECTRIC VIBRATORS



Keep Your Bins, Hoppers and Chutes

Open and Free-Flowing!

Banged-up and dented bins and hoppers cost money in replacement and in man hours lost—and that's where SYNTRON Vibrators come in. They eliminate the arching and plugging that takes a man's time to pound, and damage, those bins and hoppers.



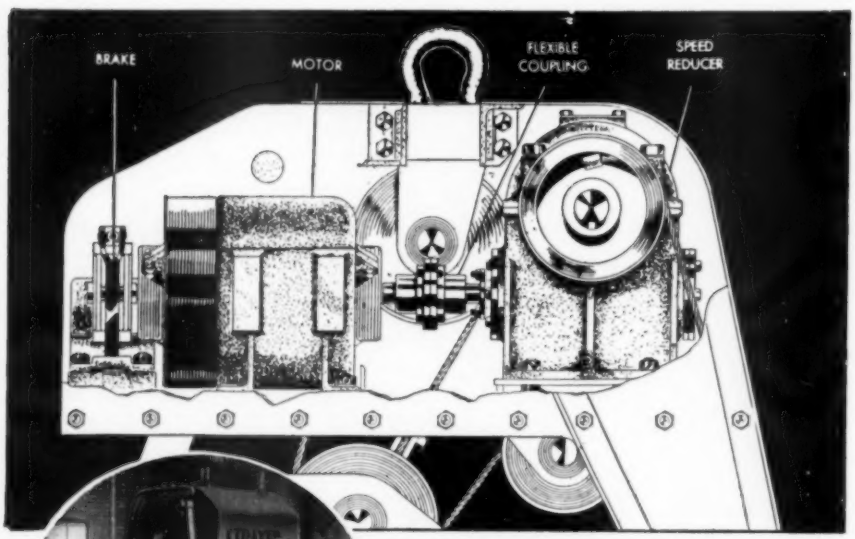
What they are—pulsating electromagnets that produce 3600 vibrations per minute from 110, 220 or 440 volt, 60 cycle A.C. There are no cams, gears, or eccentrics—merely electro-magnetic reciprocation from half-wave rectified current.

Where can they be applied—to any size and shape of bin, hopper and chute—whether made of steel, wood or concrete.

How are they applied—thickness or gauge of wall is the most important factor. However, overall dimensions, cubic content, degree of fineness and moisture content of coal must also be considered.

Write, giving the details of your troublesome bin or hopper—our Engineering Department will be glad to give you their recommendations.

SYNTRON CO., 540 Lexington, Homer City, Pa.



HOOK 'ER ON—PLUG 'ER IN

ABOVE YOU SEE WHY the Erie Electric Bucket works in its own headroom controlled from the crane cab. This sturdily constructed bucket needs only to be hooked over the crane hook and power line plugged in. The man in the cab controls the opening of the bucket from cracking the lips to any degree of opening or closing. The extra in-built weight permits easy penetration. *Write for complete particulars.*

ERIE STEEL CONSTRUCTION CO
1061 GEIST ROAD • ERIE PA

ERIE BUCKETS THE MOST COMPLETE LINE BUILT

» ALSO AGGREMETERS
ELECTRIC OVERHEAD CRANES
PORTABLE CONCRETE PLANTS

(*Continued from page* 234)

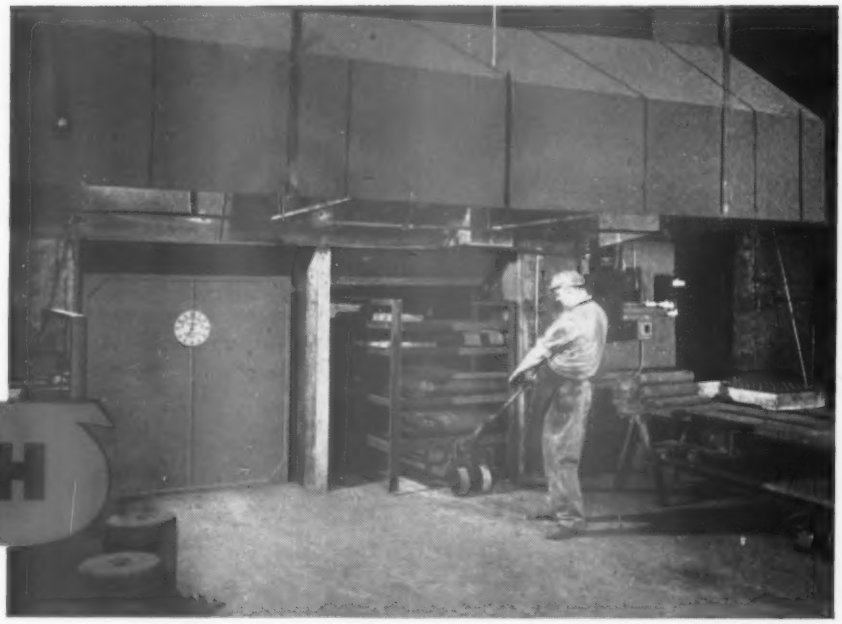
Machine is said to extend the range of composition of materials which can be analyzed and to save laboratory time because it records x-ray intensities on a continuous strip of chart paper, revealing both the angular placement of the characteristic lines of materials and their relative intensities.

Swivel: General Machine & Welding Works, 1100 East Second St., Pomona, Calif.—Annular ball bearing swivels were developed and tested for use with long lengths of wire rope, since wire rope has the tendency to twist and to unlay.

Swivels use the entire bearing surface of three ball races and are designed to swivel freely under maximum load. Bearings are protected from dirt and water by a heavy, lifetime grease packing sealed at the factory. Swivels are precision machined of high strength steel and are available in ten different styles—hook and clevis, clevis and eye, swedge and stud, etc. They are cadmium plated.

Wheel Dressers: Crown Industrial Products Co., 1504 East 53rd St., Chicago 15—Grinding wheel dressers are equipped with an emery wheel which turns on bearings and is said to do a good job of balancing the wheel being dressed. The dressers also may be used to shape wheels for grinding special contours. Dressers are available in two sizes—one with 3-in. diam emery wheel and the other with 4-in. diam wheel. Smaller unit has the emery wheel mounted on hardened steel bearings protected from dirt and abrasive. Provision is made for lubrication. Cutting wheel in the larger size is mounted on precision, sealed ball bearings. A

(*Continued on page* 238)



These convenient, rack-loaded ovens bake cores of all sizes from one ounce to a ton at Christensen & Olsen Foundry Co., Chicago.

DESPATCH

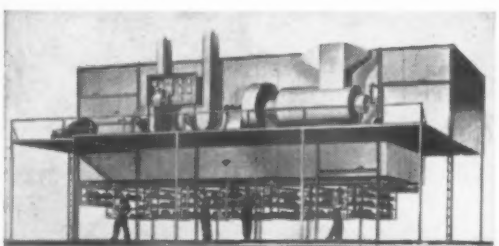
These FOUNDRY OVENS

Chosen In EXPANSION PROGRAM To Give

FLEXIBILITY. These convenient rack-loaded ovens make efficient use of space and labor to provide maximum flexibility for a custom foundry.

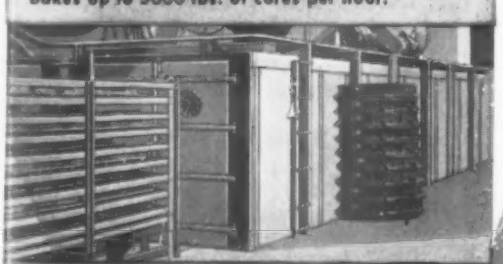
SPEED. Fast, uniform, high quality baking are the result of rapid, high-efficiency air distribution . . . up to 75% recirculation of heated air . . . plus automatic heat control.

IMPROVED WORKING CONDITIONS. Special exhaust stacks remove most of moisture-laden air and fumes. Large exhaust hood over oven work openings minimizes heat and fumes when doors are opened.



CONTINUOUS-CONVEYOR oven with Despatch combination gas and oil fired heater.

VERTICAL CONVEYOR oil-fired Despatch Oven. Bakes up to 5000 lbs. of cores per hour.



INTERMITTENT CONVEYOR (on floor) pulls racks through chamber. Bakes 4800 lbs. per hour.

BRASS, BRONZE AND ALUMINUM castings in a wide range of types and sizes are baked in these space-saving gas fired DESPATCH Foundry Ovens, recently installed at Christensen & Olsen Foundry Co., Chicago.

With 60 employees this foundry pours a maximum of 12½ tons of castings ranging in size from one ounce to a ton. Main products include valves and gear blanks, aluminum castings and phosphor bronze bars.

At left are three other typical examples of DESPATCH Ovens chosen to fit a specific need. *All types and sizes avail-*

DESPATCH

Oven Advantages

- **Bakes Faster.** Reduces baking time as much as 50%!
- **Eliminates Rejects.** Heated air surges uniformly throughout oven . . . bakes evenly . . . avoids burned cores.
- **Saves Labor.** Convenient loading and *fast, automatic* baking give maximum core output per man.
- **Cuts Baking Costs.** Efficient heaters, heavy insulation, etc., conserve heat, save fuel.

DESPATCH OVEN COMPANY

Minneapolis Office: 619 S.E. 8th St.
Chicago Office: 211 N. LaSalle St.
Offices in All Principal Cities

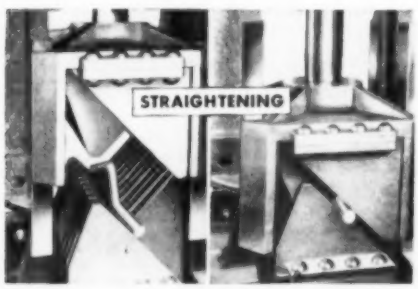
Write today for Bulletin J-31. See Despatch Bulletin in 1949 Sweet's File for Mechanical Industries.

DESPATCH OVEN COMPANY

HAND YOURSELF

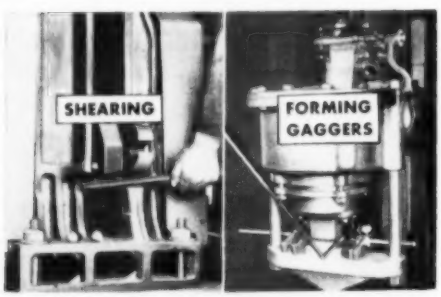
A MONTHLY DIVIDEND

The American Rod Straightener has proved itself a real dividend payer. Substantial savings of time, labor and materials are being effected by its use in hundreds of foundries. The machine is easy to operate . . . in most cases being run by unskilled labor . . . . and works as fast as material can be fed into it. Four models are available to fit your needs.



The machine makes scrap piles a thing of the past. Bent core rods are quickly salvaged, permitting their reuse many times. As rods are fed into the machine they are struck at four points simultaneously, and straightened by the action of one blow. See photo above. The shearing of rods to size and the forming of gaggers are illustrated below.

Write for Bulletin 10-B



American
WHEELABRATOR & EQUIPMENT CORP.
(FORMERLY AMERICAN FOUNDRY EQUIPMENT CO.)
505 S. Byrkit St. Mishawaka, Indiana

CORE ROD STRAIGHTENER

(*Continued from page* 236)

portion of the handle on this dresser may be removed leaving a straight shank suitable for clamping in the tool holder of a cylindrical grinder. Replacement cutting wheels are available for both dressers.

Eye Sweep: General Scientific Equipment Co., 2700 West Huntingdon St., Philadelphia 32—Eye sweep is a first-aid instrument designed for use wherever industrial accidents occur, and especially where workers

are exposed to flying metallic fragments, filings or other foreign metal substances subject to magnetic attraction. One end is fitted with a magnet for removing steel splinters, and the other is fitted with a flexible loop for removing cinders, dust and other particles. Sterilization of the instrument is said not to diminish the magnetic qualities nor affect the loop. Hard rubber carrying case is provided with each sweep.

Elevator Bucket: Pekay Machine & Engineering Co., 100 North LaSalle St., Chicago 2—Elevator bucket features an independent ejector plate which serves as the back of the bucket, but which is attached to the elevator belt by an entirely separate mounting than that used for the bucket. Passage of this mounting over the radius of the head pulley moves the ejector plate in a sweeping action which dislodges contents of the bucket. Constructed of 3/16-in. steel plate, the self-cleaning buckets are available in standard sizes; special sizes can be supplied to order.

Plastic Patch: Howard Paint Division of Reconditioning Products, 5201 Denison Ave., Cleveland—Plastic patch developed to repair castings, heat ducts, air conditioning systems, water pipes and heating systems is available in three unit sizes, each depending upon the thickness of the patch required. Applica-

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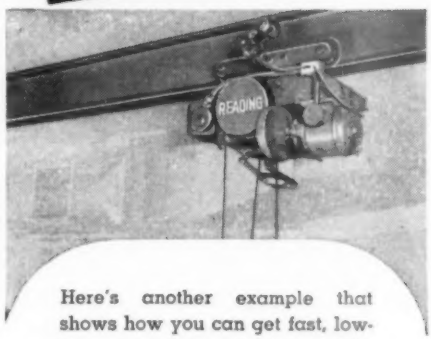

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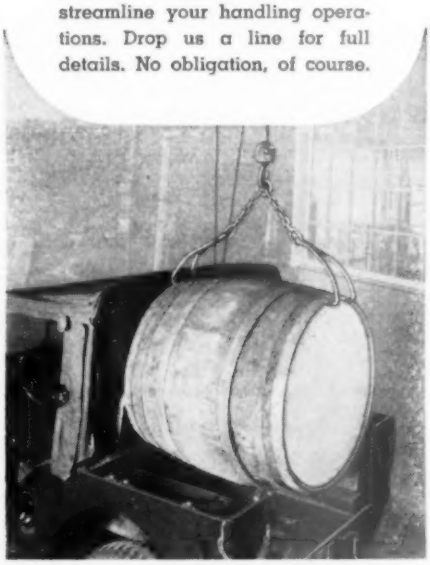

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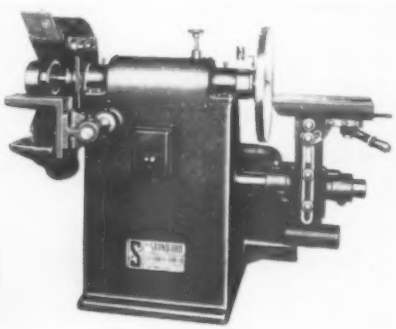
tion of the patch is done in three basic steps: Preparation of the surface, smoothing out plastic patch materials over damaged area and spraying or brushing the patch with the company's "new metal." Patch is said to be waterproof and rustproof and to form a strong bond with the parent metal.

Adhesive: Minnesota Mining & Mfg. Co., 900 Fauquier Ave., St. Paul, Minn. — Unsupported film of pure adhesive is said to provide a metal-to-metal bond resistant to shear tests up to 3500 psi. Film is placed between units to be bonded and is cured by simultaneous application of heat and pressure—a heat of 300 to 500°F for 5 to 60 minutes and a pressure of 25 to 100 psi, both varying with the type of bond desired. High bonding strength to a wide variety of materials is claimed and the adhesive is said to be inert in water. oils and most solvents. Film is available in rolls like tape and roughly resembles cellophane in appearance. It is not tacky to the touch.

Grinder: Standard Electrical Tool Co., 2507 River Rd., Cincinnati 4—Heavy duty grinder is powered with a 7½ hp, 1150 rpm motor for 20 x 3-in. grinding wheels. Machine is ball-bearing equipped and the guards are of structural plate steel



adjustable to wheel wear. Each guard has hinged door, exhaust outlet, and adjustable spark breaker. A push button safety starter having overload protection is conveniently located. Optional equipment is the removeable water pot and the safety glass eye shields.

Cab Heater: Lintern Corp., 64 Lincoln Ave., Berea, O.—Ventilating heater for general purpose crane cabs and other isolated spaces is said to be compact enough to fit into any crane cab, with completely concealed operating parts and electrical connections which are readily accessible for service. Heater serves the year around, furnishing ventilation and

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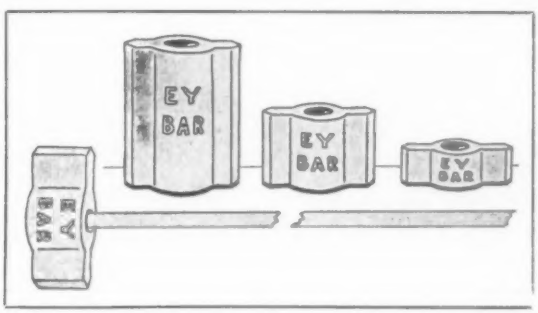

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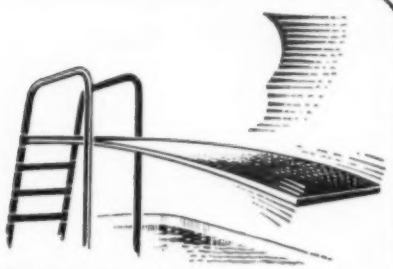

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Resistance to impact is a feature of great interest to the engineering designer; this much-sought quality is within the power of every gray iron foundry to impart to cast iron merely by ladle additions.

A typical test shows that the addition of 0.35% Mo to a good base iron increased the resilience from 340 in. lb. to 575 in. lb., an increase of 69% in this important property.

This is one of the well-authenticated facts concerning the properties of Molybdenum cast iron, details of which will be furnished on request.

Authoritative engineering data on Molybdenum cast iron and its applications are furnished by Climax Molybdenum Company.

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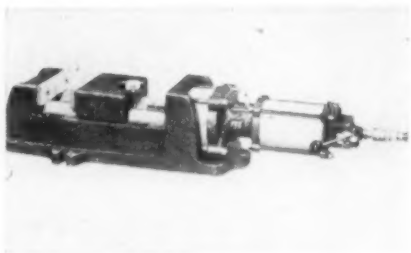
air movement throughout the cab, winter and summer. At 0° F the heater will raise 1300 cu ft of recirculated air to 60°, or 250 cu ft of air to 52°, using 100 per cent outside air. Heater measures 25 in. long, 22 in. high and 14 in. deep.

Air-Hydraulic Vise: Bellows Co., 222 West Market So., Akron 9, O.—Vise uses flexible, controlled air pressure as a clamping force and develops a clamping pressure of 150 times any operating air line pressure up to 125 psi. Jaw openings are adjustable from a fraction of an inch



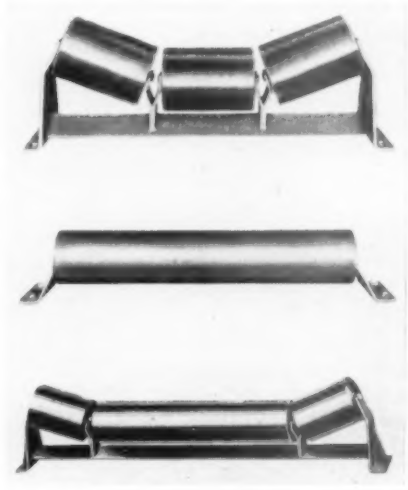
to a maximum of 5 in. in increments of 1/32-in. through a positive locking adjusting nut on the hydraulic ram. Vise operates through the full range of the jaw opening with a jaw power movement of only ½-in. Hardened steel jaws are 6 in. wide, 1-5/8 in. high and are faced with soft steel false jaws. Vise is available with mechanically operated valve for hand operation or for mechanical syncronization to machine movement, or with a low voltage solenoid valve for electrical operation. Overall length is 30-3/16 in., width 9 in. and height 6-1/8 in.

Wax: S. C. Johnson & Son Inc., 1525 Howe St., Racine, Wis. — Water emulsion wax used as a rust-inhibiting coating for metals can be applied by dipping, spraying, wiping, or flow-coating and forms a dry wax plating on the metal that is said to check corrosion. One gallon is said to cover between 2500 and 3000 sq ft. It is nonflammable and nontoxic and can be removed by degreasing.

Abrasive Powders: Linde Air Products Co., Unit of Union Carbide & Carbon Corp., 30 East 42nd St., New York 17—Two high purity alumina powders said to be characterized by ultra-fine, uniform particle size, exceptional hardness and large surface area have had successful application as abrasives in metallographic polishing, and may be used as catalyst carriers in chemical processes. Type A-5175, alpha aluminum oxide, has hexagonal crystal structure, hardness of 9Moh, particle size of approximately 0.3 micron and apparent density of 4 grams per cu cm. Type B-5125, gamma aluminum oxide, has cubic crystalline form, hardness of 8 Moh, particle size less than 0.1 micron and apparent density of 3.6 grams per cu cm.

Electrode: Hobart Brothers Co., Hobart Square, Troy, O.—One hundred per cent nickel electrode is designed to produce machinable welds on cast iron without preheating the metal. The welds are said to be machinable both in the deposit and line of fusion and may be drilled, tapped or machined at any point in the weld zone. Electrodes are said to be free from fluorides and not to produce injurious gasses. Insulated coating prevents arcing through when working in confined quarters. They may be used with alternating or direct current and are available in 3/32, 1/8, 5/32 and 3/16-in. diam.

Belt Idler: Palmer - Bee Co., Westminster at Grand Trunk Railroad, Detroit 12—Sturdy belt idler is simply constructed, utilizing precision "lubricated for life" bearings. Because no greasing is necessary there are no grease seals, fittings or piping and no cost for grease or its application during the life of the bearings, it is claimed. Idler rolls are iden-

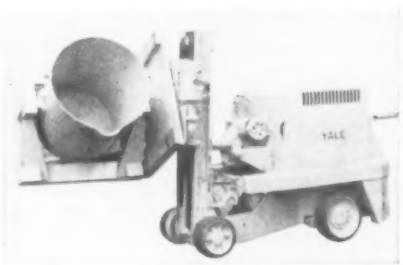


tical for each width of belt and are easily removable by hand and completely interchangeable.

Solvent: Swan-Finch Oil Corp., 30 Rockefeller Plaza, New York—Sludge and gum solvent for hydraulic equipment can be added to regular hydraulic oils to remedy sluggish operation caused by contaminants, it is claimed. After the recommended 100-150 working hours allowed for

the treatment, the system should be completely drained and new oil put in. Gum and sludge, either in solution or suspension, are removed with the dirty oil. The product is not a lubricant and cannot be used in place of hydraulic oil. It is said to be noncorrosive.

Ladle Truck: Yale & Towne Mfg. Co., 4530 Tacony St., Philadelphia 24—New 6000-lb capacity truck-and-ladle was designed to transport, rapidly, hot molten metal from cupola to pouring floor and to pour molten metal without having to remove the ladle from the truck. The



360-degree rotor attachment has two speeds, the slower speed providing added control when actually pouring the metal. In operation, the ladle is picked up by forks (ladle base is designed for four-way pickup) lifted to desired pouring height and rotated to pour as desired. Truck used in this application is an end control fork model of 54-in. wheelbase, 83-in. mast height and 45-in. overall width. Turning radius, outside edge of truck with 22-in. long forks, is 96 in. The 4150-lb capacity ladle is 34½ in. in diameter by 39 in. high. Rotating device is interchangeable with standard lift forks.

Abrasive Belts: Minnesota Mining & Mfg. Co., 900 Fauquier Ave., St. Paul 6—New cloth abrasive belts are designed with a resin bond to provide extra durability and heat resistance and are available in widths up to 18 in. and in lengths from 60 in. up. Belting consists of aluminum oxide mineral grains in grits from 24 to 120 coated with a resin bond onto a flexible cloth backing.

Conveyor Belt Fasteners: Armstrong-Bray & Co., 5364 Northwest Highway, Chicago 30 — Belt fasteners are designed to enable the butting of belt ends together into a smooth, flexible, tight joint. Made of heavy gage steel, they are said to withstand any load the belt can carry safely. They provide a two-sided joint that passes under strip-

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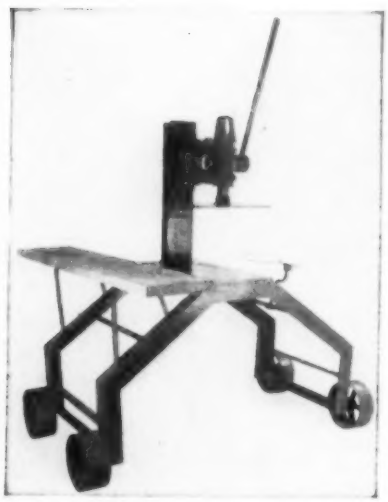

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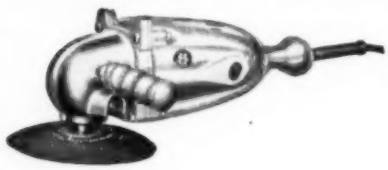
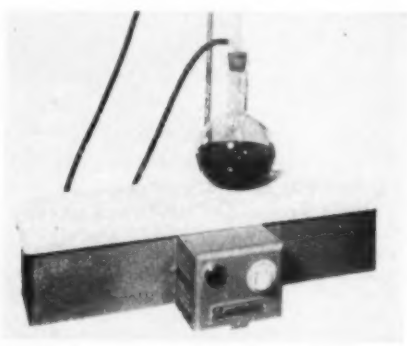
pers and permits use of both sides of the belt. Individually spaced, they permit troughing. The fasteners are provided for belts from ¼ to 1½ in. thick. Companion repair plates also are available for repairing tears and cuts or for inserting patches in worn spots.

Sander: United States Electrical Tool Co., 1050 Findlay St., Cincinnati 14—High speed 7-in. sander is said to be amply powered for metal finishing, removing scale and rust



with wire brush and for smoothing welds and casting ridges with cup grinding wheel. Features include straightline motor ventilation; air outlet diverts dust-laden air away from operator; 3-in-1 flexible rubber pad adapts sander to curved or flat surfaces; ball type rear handle and thumb operated switch; reversible side handle, and good handling balance. Motor operates on alternating or direct current, 25 to 60 c, 110 v (also available for 220 or 250 v). Overall length is 15⅜ in.; weight is 12½ lb, and no load speed, 5000 rpm.

Hot Plate: Lindberg Engineering Co., 2453 West Hubbard St., Chicago 12—New laboratory hot plate is designed to aid the laboratory technician in his work of extraction, evaporation, and overnight concentration of analytical samples. Unit



has a plate 5 in. wide by 22½ in. long, permitting placement of the containers side by side thus giving an unobstructed view of the action taking place. Hot plate has 1300-watt capacity, 115/230 v, 60 c; plate temperatures are controlled by a knob mounted on the front of the hot plate. Four clamp sockets to accommodate dovetail support clamps are mounted on the rear of the hot plate.

Lamp Changers: Industrial Products Co., 2827 North Fourth St., Philadelphia 33—Lamp changers are designed to remove and replace lamp bulbs in high and out of the way places. Rubber covered flexible spring fingers are connected to a 6-ft pole by a coil spring. The fingers are pushed over the lamp bulb and the pole rotated to remove or insert a bulb from or into an electrical socket. A pull cord attached to a swivel ring bends the coil spring and allows placing the fingers at any desired angle to grasp the bulb. Changers are available in two sizes—for lamps up to 3-in. diam or 5-in. diam. They are for use only with screw type lamps in rigid sockets. Six-foot extension poles also are available.

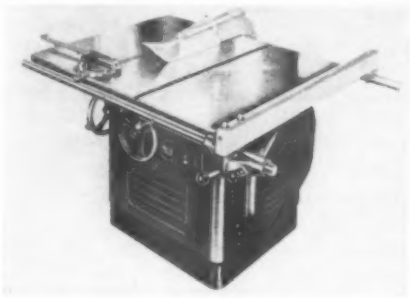
Safety Goggle: American Optical Co., Southbridge, Mass.—New head rest safety goggle can be thrown into "off-guard" position by a flick of the wrist. Goggle is well balanced, and, because of the spring

mechanism, there is said to be no overhanging weight with the goggle in any position. Adjustment to facial contours and correct pupillary distances can be made quickly, without tools, and once the adjustment is made for any face, no readjustment is necessary. Goggle protects eyes against injurious light radiations, glare, flying sparks and scale. It may be worn directly over the eyes or personal prescription glasses. Fiber headgear with leather sweatband fits comfortably and is adjustable to any head size by a nut turning on a right and left-hand threaded stud.

Ramming Mixture: Quigley Co., 527 Fifth Ave., New York 17—Refractory mineral and special binder ramming mixture is intended for use in forging, pit, annealing, blast, rod, slab and heat treating furnace bottoms, and for forming burner blocks, cupola and melting furnace spouts and runners, ladle linings and as a patching materials in general furnace maintenance. Features claimed are that it will air-set at room temperature, has high strength before being fired, increased strength under heat, has

low coefficient of expansion, high resistance to thermal shock and no shrinkage during drying or under operations. It is shipped in dry form in 100 lb bags and is mixed with water for use.

Tilting Arbor Saw: Delta Mfg. Division, Rockwell Mfg. Co., 600 East Vienna Ave., Milwaukee 1—Twelve-inch tilting arbor saw is cap-



able of cutting through 4⅛ in. stock on a square cut and of splitting a 4-ft panel into two 24-in. parallel sections. It will do straight ripping, cut-off work, miter cutting (compound, also), rabbeting, grooving, tongue and groove work, dadoing, sticking, shaping and other jobs. It can be used for aluminum, carbon, and other like materials. The saw blade, tilted to the right at an angle of 45 degrees, will cut stock 2⅞ in. thick. Table is 38 in. long, 48 in. wide, with a 16-in. space in front of the saw blade.

Protective Mask: General Scientific Equipment Co., 2700 West Huntingdon St., Philadelphia 32—Protective mask consists of a plas-

tic shield, which is held in position by an adjustable elastic head band, and replaceable laminated filters. It is designed to protect throat, nose and bronchial tubes from larger particles of nontoxic dusts but is not intended for fine silica dust, lead, arsenic and other toxic dusts. Mask weighs less than ½ oz and is said to be cool and comfortable.

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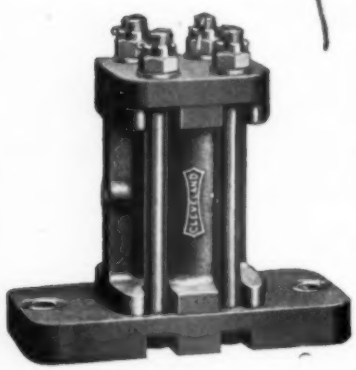

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TABLE V—Rate of Gas Evolution With Increased Metal Temperature

Metal Temperature, °F	1300	1400	1500	1600
Elapsed Time, Minutes	*cc of gas*			
½	30	25	30	30
1	45	40	45	45
1½	60	55	60	60
2	75	70	75	75
2½	80	75	80	80
3	85	80	85	85
3½	90	85	94	87
4	90	90	95	87
4½	90	90	95	87
5	90	90	95	87

Sand was AFS 66-70 mesh high-purity silica. To this was added a linseed base core oil in ratio of 1-100 by weight.

TABLE VI—Temperature of Thermocouple Enclosed in Empty Iron Tube Compared with Metal Temperature

Metal Temperature, °F	1300	1400	1500	1600
Elapsed Time, Minutes	*Temp. of Thermocouple in Tube, °F.*			
½	1100	1100	1100	1200
1	1110	1125	1135	1225
1½	1135	1140	1145	1225
2	1145	1145	1150	1200
2½	1145	1150	1150	1170
3	1140	1145	1150	1155
3½	1135	1140	1150	1155
4	1130	1135	1145	1155

TABLE VII—Apparent Slopes of Gas Evolution

Time Interval, Min.	0–½	½–1	1–2	2–3	
					Time Curve Leveled, Min.
*Binder**	*Apparent Slopes*				
1	160	135	100	80	5
2	180	180	100	50	4½
3	240	120	120	100	4
4	160	100	130	100	4
5	200	160	120	80	4
6	160	120	100	80	3½
7	240	120	100	80	5
8	200	80	80	80	4½
9	200	100	90	80	4
10	280	280	120	40	4
11	240	240	100	30	3½
12	400	360	120	100	3
13	240	200	100	20	2½
14	240	160	70	10	2½
15	240	340	280	100	4
16	240	480	120	50	4
17	280	240	220	60	3

Actual gas in cc is equal to the slope multiplied by the time interval. * See Table 1 for explanation of binder numbers.

GASES GIVEN OFF BY CORE BINDERS

(Continued from page 87)

10 cc of gas are given off in ½ minute, the apparent slope would be 10 divided by ½ or 20. If after 1 minute an additional 5 cc of gas has been given off, then the apparent slope for this second ½-minute interval would be 5 divided by ½ or 10, and so on. This is illustrated in Fig. 27.

This equation was applied to all the binders with the results shown in Table VII. Urea resins and cereal flours had about the same values and both of these groups had higher apparent slopes in the first minute than did the other groups. Petroleum base oils had higher apparent slope than linseed base binders for the first half minute, but thereafter the linseed base oils had higher rate of gas evolution than did the petroleum base oils.

The urea resins completed gas evolution and leveled off on their curve much faster than the other groups, followed by cereal flours, linseed, and petroleum base oils in that order. Urea resins required an average of only 3 minutes to give up all their gas while petroleum base oils required an average of 4½ minutes. This is also a good measure of the relative collapsibility of the binders.

Strength-Gas Content Ratio—In the preceding article the maximum strengths of the binders were obtained. The maximum psi thus obtained was divided by the total amount of gas obtained from each binder to give a relation which is shown in bar chart form in Fig. 29. The higher the bar the more strength that can be expected with comparable gas evolution, or, in other words,

TABLE VIII—Comparison of Properties of Core Binders in Decreasing Order of Overall Desirability

Binder No.	Base	Strength	Relative Economy	Total Gas	Rate of Gas Evolution	Collapsibility	Internal Hardness	External Hardness	Baking
11	Urea Resin	3	10	4	6	3	3	1	2
1	Linseed	1	1	5	11	6	1	2	7
10	Urea Resin	2	12	7	4	4	3	1	2
2	Linseed	3	4	8	9	5	2	3	7
7	Petroleum	4	3	5	9	6	8	9	6
9	Petroleum	8	8	2	10	4	6	5	7
15	Cereal Flour	9	2	12	3	4	9	10	1
3	Linseed	4	7	8	9	4	5	8	6
5	Linseed	6	5	3	9	5	7	8	9
4	Pure Linseed	5	11	6	13	4	4	4	7
6	Linseed	7	6	2	12	3	10	6	10
14	Urea Resin	12	15	1	8	1	16	1	5
16	Cereal Flour	10	9	10	2	4	12	11	2
8	Petroleum	7	9	2	12	5	11	7	8
12	Urea Resin	9	14	11	1	2	14	8	4
13	Urea Resin	11	15	2	7	1	15	13	3
17	Cereal Flour	13	13	9	5	2	13	12	3

Increasing number denotes decreasing desirability of binder for the particular property. No. 1 means the following for the table: Greatest strength, greatest strength for each cent of cost, lowest gas content, fastest evolution of gas, most rapid collapsibility, highest internal hardness, highest external hardness, lowest temperature and time of baking. Thus, by adding all the values across the table the lowest total indicates the best all around binder, but careful evaluation should be made for particular properties desired.

the higher the strength-gas ratio the less gas is evolved from cores of equivalent strength. The average values obtained were in fairly close agreement for the linseed and petroleum base oils and two of the urea resins. The other three urea resins and the cereal flours gave very low results. Greatest variation in results within each class occurred with linseed base oils. Only pure linseed oil, three urea resins, and three cereal flours failed to give satisfactory values.

Summary—In making a final choice of binder the following facts must be considered: Strength requirements, cost, collapsibility, rate of gas evolution, baking economy, and internal and external hardness. The foundryman should first check off these items in the order of importance to him. Once he has decided on the type of binder he wants he should secure several binders of that type and then make a few simple tests as outlined in this article to separate the good from the bad ones. This should enable him to choose his binder wisely and know what he is getting for his money. It should be remembered that no binder is a cure-all. It may often be necessary to use more than one type of binder for different job requirements. Quite often a blend of binders will offer advantages which cannot be obtained otherwise.

Table VIII gives a summary of the results obtained in the tests.

Offers Centennial Bulletin

In recognition of the one hundreth birthday of the state of Wisconsin, Belle City Malleable Iron Co., and its subsidiary Racine Steel Castings Co., Racine, Wis., have issued a special centennial number of the employee publication, *Foundryways*, formerly known as *Bel Rac News*. The 26-page folder describes the community of Racine, the plant, and the people who comprise them and is well illustrated with points of interest.

Management Quizzes

American Management Association, 330 West 42nd St., New York 18, has published two quizzes by which supervisors, foremen and higher executives can test their knowledge of management principles. One is titled "What's Your Management I.Q.?" and costs 20 cents. The other is "Self-analysis Quiz for Supervisors and Executives," and costs 25 cents.

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...TRADE PUBLICATIONS...

MALLEABLEIZING FURNACES: Surface Combustion Corp., P. O. Box 907, Toledo 1, O.—Bulletin SC-140 describes batch and continuous types of radiant tube heated malleableizing furnaces. Performance data for large and small scale production of pearlitic and standard malleable irons are shown. A chart shows comparative costs of gas and electricity as fuels for malleableizing.

MEEHANITE: Meehanite Metal Corp., Pershing Square Bldg., New Rochelle, N. Y.—Bulletin, "How to Use Meehanite Design Data," is designed to supplement Bulletin 26, "Formulas for Computing Maximum Stresses and Deflection in Circular Flat Plates." Supplement gives typical examples of the application of formulas and charts presented in Bulletin 26.

COMPRESSOR SYSTEMS: Davey Compressor Co., North Water St., Kent, O.— Bulletin E-215-B describes departmental system of industrial air compressor operation and compares the departmental plan with centralized systems, listing advantages of each. Installation diagrams and photos are included, together with complete departmental specifications.

ELECTRODES: Arcos Corp., 1500 South 50th St., Philadelphia 43—Technical data sheet analyzes alloy electrodes for use in fabrication welding and salvage of both high and low alloy castings. ACI casting designations are listed by type and electrodes recommended for use with each. Also tabulated are tensile properties and weld metal compositions.

CHEMICAL PRODUCTS: General Electric Co., Chemical Dept., One Plastics Ave., Pittsfield, Mass—Booklet CDP-567 lists the products manufactured by the company's chemical department. Products of the plastics, resin and insulation materials, metallurgy and compound divisions are described and their industrial applications outlined.

ALUMINUM PAINT: Brooklyn Varnish Mfg. Co., 50 Jay St., Brooklyn 1, N. Y.—Bulletin describes and presents application illustrations of the company's aluminum paint. Selector chart is included to aid in selecting an aluminum coating by matching job requirements to one of the nine aluminum paints listed.

BELTING: Buckner Process Co., Dept. 55, 554 Main St., Worcester 8, Mass.—Illustrated circular details the functions and scope of conveyor belting, transmission belting and safety matting. An impregnation process for increasing belt life is explained.

CUTTING TOOLS: Severance Tool Industries Inc., Box J-850, Saginaw, Mich.—Bulletin 16-C lists the company's line of countersinks and includes a table of suggested countersinking speeds. In the section on ball seat reamers information is given on uses, materials on which the reamers can be used, machines used for driving, finishes obtainable, operating speeds, and lubricants. Similar information is given for ball nose drills, taper reamers and drill reamers.

DIE CASTING: Cleveland Automatic Machine Co., 4932 Beech St., Cincinnati 12—Bulletin describes the Company's model 200 universal die casting machine which is available with hot metal end for casting zinc, tin or lead; or as a cold chamber machine for casting aluminum, magnesium or brass. Specifications are included.

COMPANY HISTORY: Dravo Corp., Dravo Bldg., Fifth and Liberty Ave., Pittsburgh 22 — Publication traces the history of the corporation back to 1891 covering more than 50 years of activity in the field of power plant and pumping machinery installation for steel mills, public utilities, waterworks and industrial facilities.

HAULING MACHINES: Koehring Co., 3026 West Concordia Ave., Milwaukee 10 — Bulletin describes mechanical features of the company's materials hauling units known as Dumptors. Time study results, production charts, specifications, cutaway photographs and drawing are included in the bulletin.

BABBITT METAL: National Bearing Division, American Brake Shoe Co., 4930 Manchester Ave., St. Louis 10—Brochure and engineering brief details physical properties and outlines pouring procedures of an alloy of silver with lead that is said to be equivalent in physical properties to tin-base babbitts.

INSULATING BLOCK: American Structural Products Co., Ohio Bldg., Toledo 1, O.—Folder describes properties of the company's heat insulating block and contains charts showing heat loss, surface temperature, and efficiencies of various thicknesses of the block under different temperatures.

GRINDERS: Bridgeport-Diamond Machine Co., 2362 Main St., Stratford, Conn.—Catalog describes a line of grinders and illustrates various types and kinds of machine parts which are produced on these machine tools.

MAGNETIC BRAKE: Cutler-Hammer Inc., 244 North Twelfth St., Milwaukee 1—Publication BR-2 describes and illustrates the company's magnetic brake and provides dimension and rating tables.

MOTORS: Allis-Chambers Mfg. Co., 1126 South 70th St., Milwaukee 1—Bulletin 51B6052J provides specifications covering squirrel-cage in-

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duction motors and application data, range of sizes and speed torque curves on synchronous, wound rotor and direct current motors. It covers applications and features of gearmotors and multi-speed induction motors and lists motor controls for many requirements of motor operation.

WELDERS' GUIDE: Hobart Brothers Co., Hobart Square, Troy, O.—Pocket-size booklet gives characteristics of various welding arcs, four essentials of proper welding procedures, type of joints, typical positions, chart of standard steel shapes, photographs of good and bad welds, causes of common welding troubles and what to do about them, welding symbols, and an easy-to-use table of formulas.

CENTRIFUGAL BLOWERS: Bryant Heater Co., Industrial Division, 1020 London Rd., Cleveland 10—Bulletin 6A-4 covers a complete line of light-weight, centrifugal blowers in 4-18 oz pressures range, 6000 to 48,000 cfh capacities. Bulletin includes photos, diagrams, and capacity and dimensional tables for the complete series, and describes filter combinations for operation in difficult locations.

REPRINT: Air Reduction Sales Co., Dept. 1927P, 60 East 42nd St., New York 17—Reprint of article entitled "Oxygen in the Steel Industry—Past, Present and Future," by G. V. Slottman, provides data on oxygen uses in the steel industry including the development phase, combustion and metallurgical uses and concludes with a summary of open-hearth uses of oxygen.

MATERIALS HANDLING: Allen-Sherman-Hoff Co., 225 South Fifteenth St., Philadelphia 2—Catalog 448, titled "Hydrovac Materials Handling Systems," describes equipment used for the transportation and disposal of commercially dry material ranging in size from fine dust to lumps of various sizes.

MOTORS: U. S. Electrical Motors Inc., 200 East Slauson Ave., Los Angeles 54—Colorful and factual bulletin deals with variable speed motors, describes the operating principle of the motors and shows how they can be used in various operations.

BELT CONVEYOR: George Haiss Mfg. Co., Division of Pettibone Mulliken Corp., 141st to 144th St. on Park Ave., New York 51—Literature describes features of the company's Model 481 flat belt conveyor and gives specifications and dimensions.

WELDING CASTINGS: Tempil Corp., 132 West 22nd St., New York 11—June 15 issue of the company's periodical deals with the repair of castings by welding.

ELECTRONICS: Machlett Laboratories Inc., Springdale, Conn.—The 1948 spring issue of "Cathode Press," published by the company, contains an article on electronic core baking.

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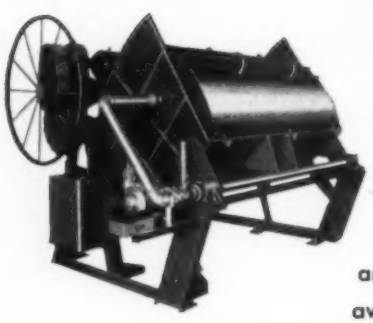

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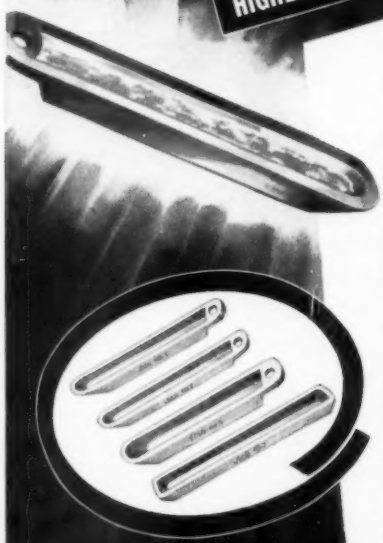

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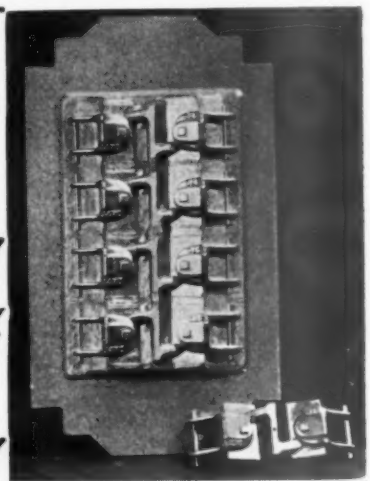

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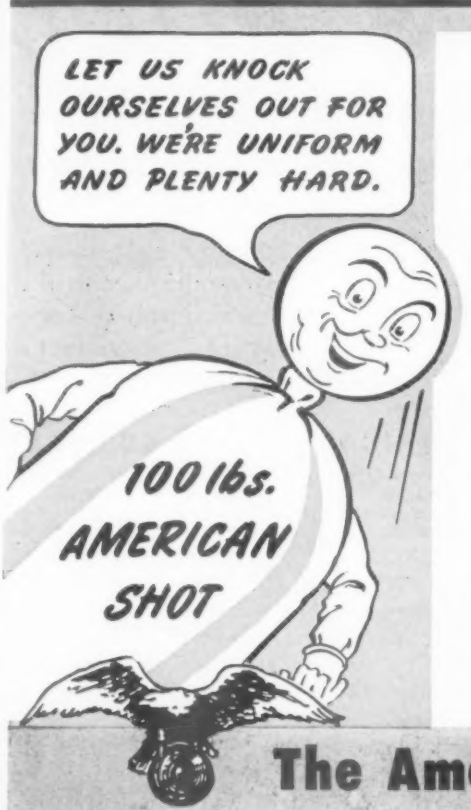

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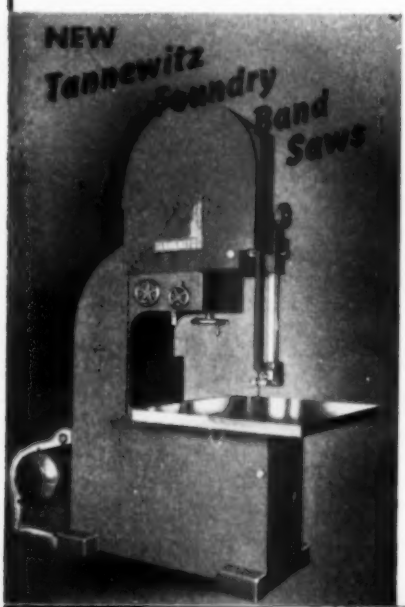

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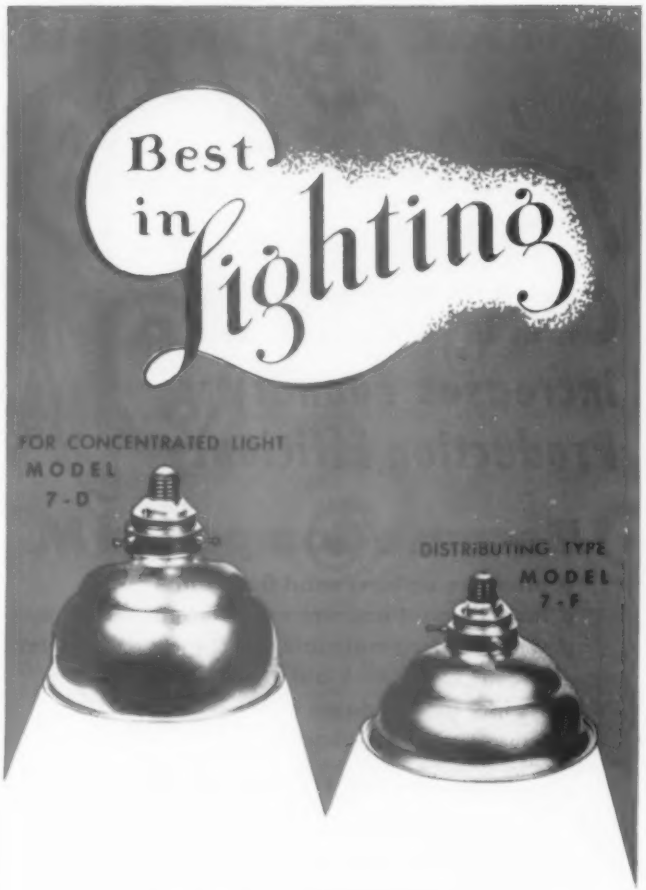

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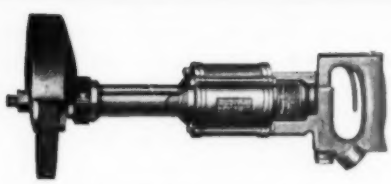

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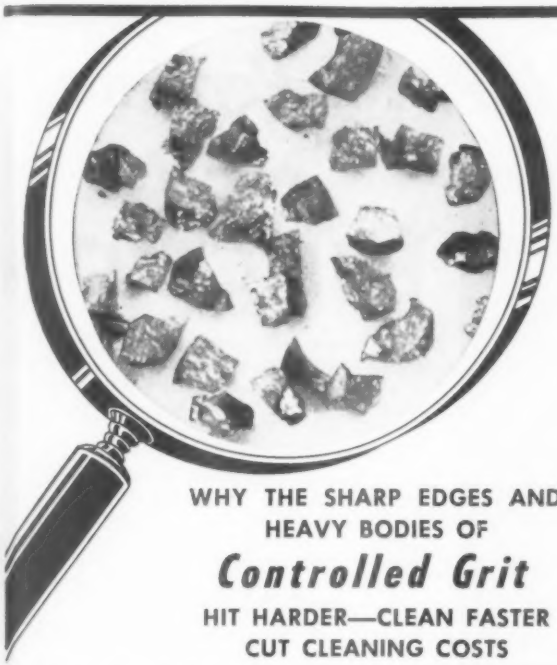
SALES • SERVICE • STOCK • COAST TO COAST



WHY THE SHARP EDGES AND HEAVY BODIES OF

Controlled Grit

HIT HARDER—CLEAN FASTER
CUT CLEANING COSTS

Shown here is a very clear idea of the reasons "Controlled Grit" does a better, faster job of cleaning. Chunky bodies like these back up the sharp edges with solid weight, and solid weight hits harder, cleans faster.

MEMBER

MANUFACTURERS ASSOCIATION INC. FOUNDRY EQUIPMENT

CASTING PROFITS START

on the

SHIPPING PLATFORM

. . . only Clean Castings Pay Off

Casting rejects cost money. Every casting sent back for re-cleaning takes its toll from profits, piles up cleaning costs. Controlled Grit cleans *clean*. Its multiple sharp edges, backed by heavy, chunky bodies hit harder, clean faster, leave surfaces thoroughly clean and free from silica dust. Further, Controlled Abrasives cut costs by wearing longer, by being reused many more times.

Get samples and full facts on Controlled Abrasives now. Write today.

Now Being Manufactured By

National Metal Abrasive Co.
Cleveland, Ohio

Controlled Abrasives

Western Metal Abrasives Co.
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SOLD EXCLUSIVELY BY

Hickman-Williams & Co. Inc.

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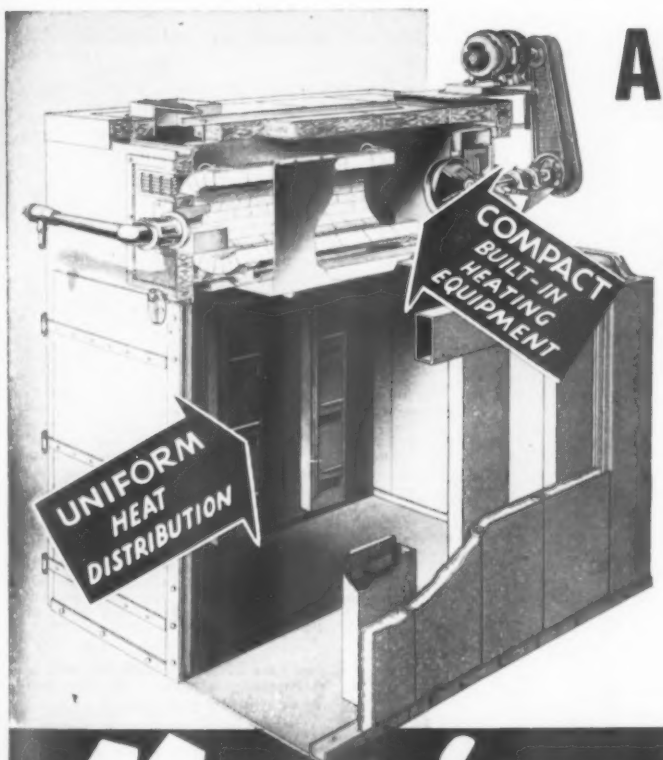

Announcing the New-

Morrison CORE OVEN

MORE PRODUCTION—with Uniformity . . . Speed
LESS COSTS—mean Fuel Savings . . . Space Savings

The new MORRISON standard Oven is designed for core-baking, mold-drying, and similar applications requiring maximum uniformity obtained by forced convection of heated air.

The MORRISON method of uniform heating by forced convection is also ideal for curing plastics, baking paint and enamel finishes, and other processing of materials up to 750° F.

Morrison ENGINEERING CORP.

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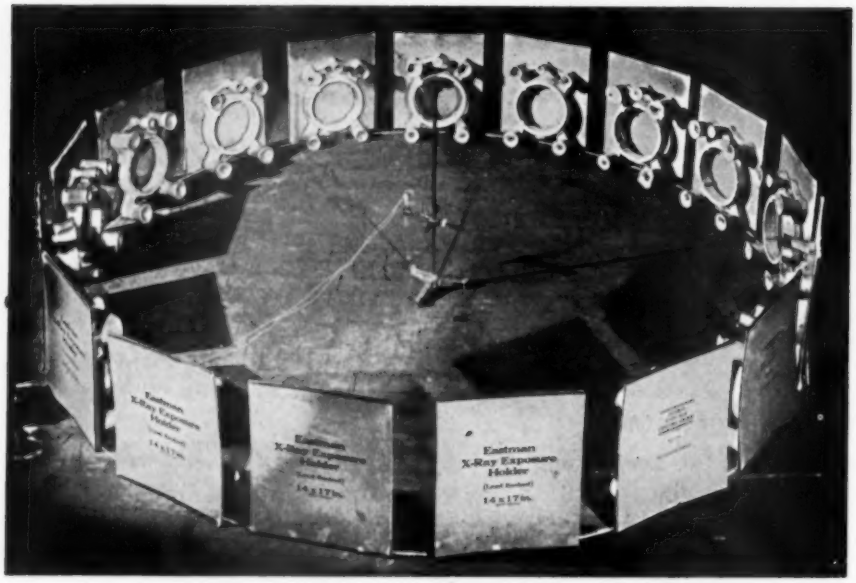
PLEASE SEND A MORRISON SPECIALIST TO SEE ME IMMEDIATELY.

FIRM ..... NAME .....

ADDRESS .....

CITY ..... STATE .....

RADIUM RADIOGRAPHY *Performs a* NEW FUNCTION



PHOTOGRAPH COURTESY OF CRANE CO.

Write us concerning any problem of Gamma Ray Radiography

"Directional solidification" can easily be studied by the set-up illustrated in the photograph—to indicate the best method of casting with a minimum of defects in the casting itself.

Radium has become a new foundry tool which directly effects an increase in yield. It permits accurate determination of the proper procedure in gating and risering "tough" castings. Seventeen cylindrical castings were radiographed simultaneously by Crane Co. to ascertain the most productive and economical foundry practice.

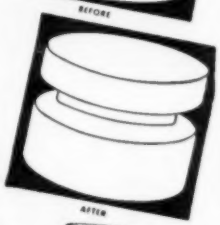
Radium thus performs a valuable additional function.

For inspection, for determination of directional solidification, Radium is available in capsules of various unit strength in duralumin holders which may be leased or purchased at low rates.

The rental includes full coverage insurance; heavy load storage containers and slide rule exposure calculators.

RADIUM CHEMICAL COMPANY, INC. • 570 Lexington Ave., New York (22), N. Y. • Chicago: Marshall Field Annex Bldg.

For Surface Blemishes in ALUMINUM CASTINGS



Have you used the Smooth-On Foundry Cement made especially to correct blow holes, porous and rough spots, dents and other unsightly but harmless surface defects in otherwise sound *aluminum* alloy castings?

Applied like the widely used Smooth-On *Iron* Foundry Cement, Smooth-On No. 8 *Aluminum* Cement fills in evenly, hardens quickly, matches perfectly. Stays in place, too, for it expands slightly as it sets.

Smooth-On No. 8 Aluminum Cement comes in 1-and 5-lb. sizes. 1 lb. will fill 17 cu. in. Order it by NAME AND NUMBER from your supply house. If they haven't it, write us. If you have not yet discovered Smooth-On No. 8, ask us for

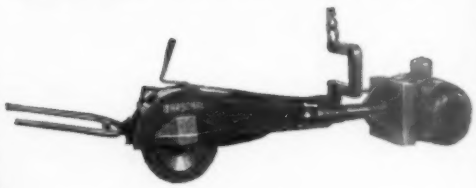
FREE SAMPLE TO TEST

You'll receive also the famous 40-page SMOOTH-ON HANDBOOK, filled with industrial uses for the various Smooth-On Cements. 170 illustrations. Write today.

SMOOTH-ON MFG. CO., Dept. 17L,
570 Communipaw Ave., Jersey City 4, N. J.

Do it with SMOOTH-ON
No. 8 ALUMINUM CEMENT

IT'S EASY TO TAKE THE GRINDER TO THE WORK



The Marschke Heavy Duty Swing Frame Grinder is easy to maneuver and gives maximum metal removal. Massively constructed for long, dependable service, this Marschke Grinder provides smooth, true wheel rotation for steady contact between the wheel and the work . . . gives minimum wheel wear. Provision is also made for adjustment of wheel surface speed to compensate for wheel wear.

Simplicity of construction, plus balance and maneuverability, contribute to efficient operation. These Marschke Grinders quickly pay for themselves and give many years of trouble-free service.

Other Marschke Grinders available include the "In-Between" Grinder, pedestal and floor stand grinders and buffers.

Write today for complete details

VONNEGUT MOULDER CORPORATION

1839 MADISON AVENUE • INDIANAPOLIS, INDIANA

QUALITY • DEPENDABILITY • SERVICE

Producers of

PressureProof

ANGELL

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CHAPLETS

and all types of nails

The Angell Nail

& CHAPLET COMPANY

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order

National BRAND

BENTONITE

highest FOUNDRY *quality*

Prompt shipment—unlimited quantities now available to foundries from BAROID—the world's largest producer of Bentonite. Our modern plants are geared to fulfill every requirement of the foundry trade.

From THESE APPROVED DISTRIBUTORS

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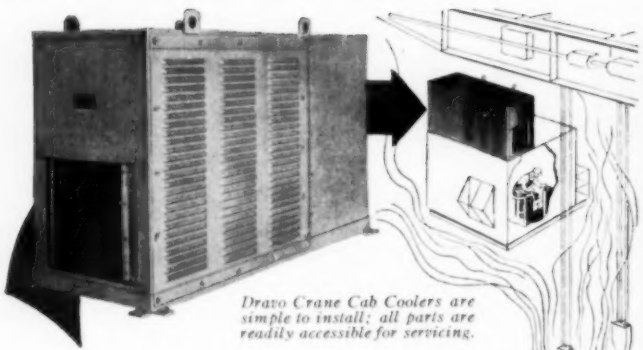
★ Sharper Castings
★ Greater Brinell Hardness
★ Increase Tensile Strength
★ Increase Transverse Strength
★ Increase Wear Resistance
★ Increase Heat Resistance

Copper Shot

IMPROVES YOUR IRON

ALTER COMPANY Fifty Years of Service
1702 Rockingham Road, Davenport, Iowa



Dravo Crane Cab Coolers are simple to install; all parts are readily accessible for servicing.

DRAVO CRANE CAB COOLERS
ASSURE OPERATOR COMFORT

Operators of hot-metal cranes are more alert and efficient when you protect them from fatigue and discomfort by air conditioning the cabs with Dravo Crane Cab Coolers.

Completely self-contained, and requiring only an electrical connection, the Dravo Crane Cab Cooler provides complete air conditioning:

Cooling	Continuous Ventilation
Fume and Odor Removal	Dehumidifying
Dust Filtering	Winter Heating

DRAVO CORPORATION
PITTSBURGH • PHILADELPHIA • CLEVELAND • NEW YORK
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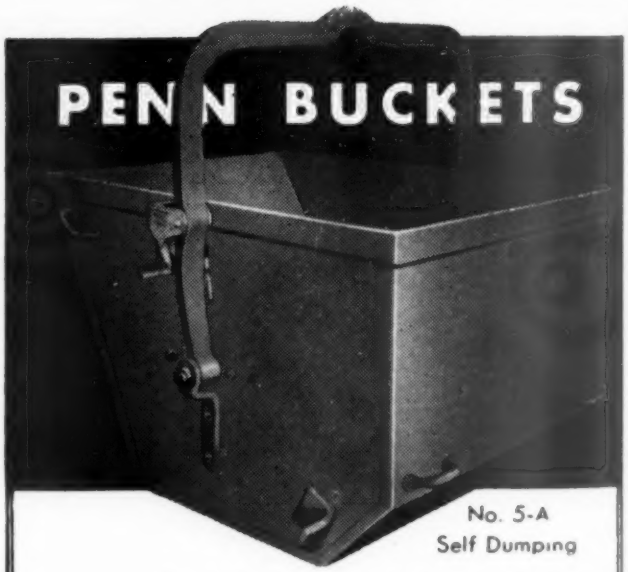
DRAVO

PENN BUCKETS



No. 5-A
Self Dumping

Careful balancing makes Penn Buckets self dumping when loaded and self righting when empty. Welded construction prevents "clinging" makes them empty easily and completely.

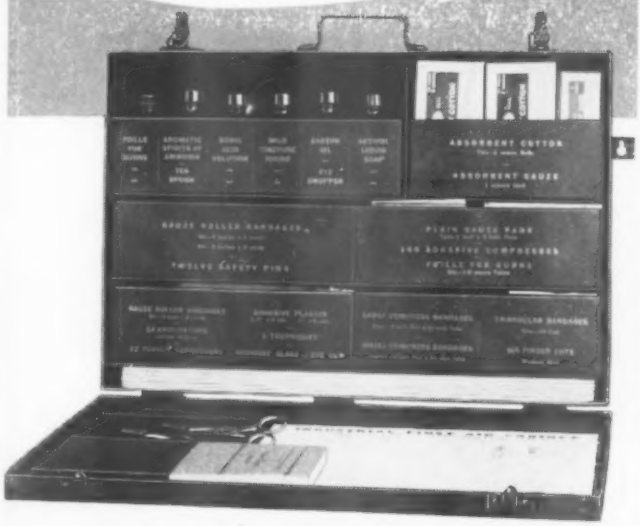
MEMBER

WRITE TODAY FOR NEW BULLETIN DIMENSION SHEET AND PRICE LIST

PENN IRON WORKS
READING, PENNA.

FOR FAST

FOUNDRY *First Aid!*



M·S·A *Industrial*

FIRST AID CABINET

A complete First Aid Cabinet for the foundry, in a sturdy steel wall-mounted cabinet. With assortment of materials meeting the various state compensation requirements, dressings are instantly located when needed and easily removed. A comprehensive first aid manual is included. Write for Bulletin FA-90.

M·S·A

FOILLE

BURN SPRAY KIT

This specialized Burn Spray Kit is always ready for instant service. Containing an ample supply of famous Foille for Burns, in jars which screw directly to spray gun, rapid coverage of burn injuries is enabled with a few strokes of pump—quickly relieving pain, preventing shock and infection, and promoting faster healing. Dressings, sterilized sheet, scissors, etc. are included in weatherproof steel case. Bulletin FA-89.

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Braddock, Thomas and Meade Streets · Pittsburgh 8, Pa.

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The Money-Making Line . . .

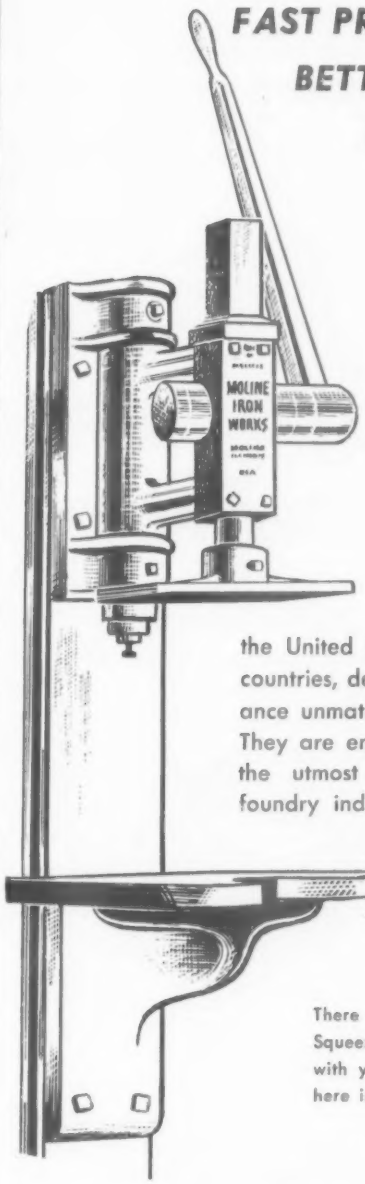
Moline

MOLDING MACHINES

FAST PRODUCTION

BETTER CASTINGS

BIGGER PROFITS



Moline Squeezers have a reputation for getting things done faster and better, and at lower cost. That is why they are being used in all types of foundries from coast to coast in batteries of from half a dozen machines to one hundred and sixty six. They are doing a big job in foundries all over the United States and in nine foreign countries, delivering a level of performance unmatched by similar equipment. They are engineered and built to give the utmost satisfaction to the vast foundry industry.

FOUR MODELS

There are four models of Moline Squeezers, designed in accordance with your specific requirements. Shown here is the No. 11 Stationary Machine.

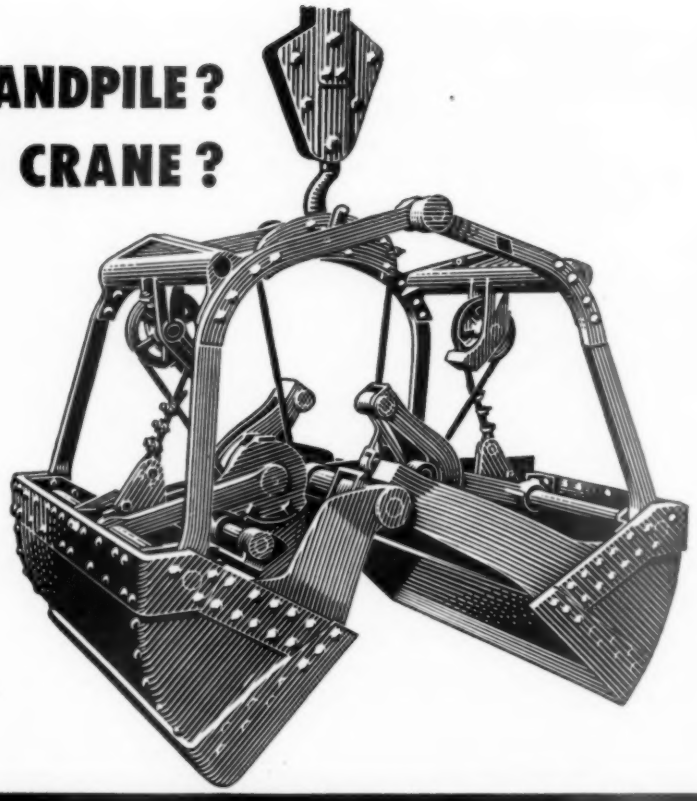
WE SHIP QUICK!

Send for our NEW Descriptive Folder.

MIW

MOLINE
IRON WORKS
MOLINE, ILLINOIS, U. S. A.

HOW HIGH IS YOUR SANDPILE?
HOW LOW IS YOUR CRANE?



Here's a Blaw-Knox Single Line, Hook-On Type Bucket that needs only 6' 7" operating headroom! Perhaps one of the 4 sizes of this design will prove exactly what you need for efficient handling of moulders' sand, coke, slack coal or other loose bulk materials. You'll find it fully described in Catalog 2232, which will be forwarded immediately on request.

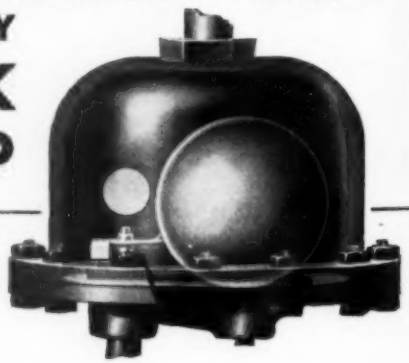
BLAW-KNOX DIVISION
OF BLAW-KNOX COMPANY
2097 FARMERS BANK BUILDING
PITTSBURGH 22, PA.

BLAW-KNOX *FOUNDRY* BUCKETS

***PREVENT* COMPRESSED AIR**
STORAGE TANK EXPLOSIONS

DELIVER AIR CLEAN AND DRY . . . INSTALL A

MURPHY
TANK
TRAP



IT NEVER FORGETS

● Automatically removes all condensate (water and oil). Leakproof. Requires no attention, no maintenance. Install it . . . and forget it. Alternate inlets for cramped space installations. Ideal for garage, service station and similar installations. Priced within reach of the smallest compressed air user.

GUARANTEED to perform as advertised or money refunded.

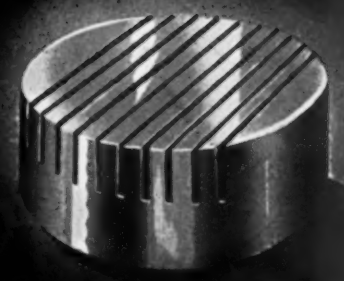
Write for literature and price.

GUARANTEED COMPRESSED AIR PRODUCTS

APTERCOOLERS • SEPARATORS • STRAINERS • TRAPS
SPRAY GUNS • PISTOL SPRAYERS

JAS. A. MURPHY & CO.
FIFTH AND VINE STREETS, HAMILTON, OHIO
Moisture Elimination Up To 3000 Pounds Per Square Inch

Precision



CORE BOX VENTS

Here's part of a complete line of DEMMLER core box vents—rigidly constructed in varying sizes of slotted brass—slotted steel—and screen mesh. Orders filled promptly from stock!

BRASS SLOTTED CORE BOX VENTS
Slot widths: .010", .013", .015"
Diameters: 1/8", 3/16", 1/4", 5/16", 3/8", 7/16", 1/2", 5/8", 3/4", 7/8", 1", 1 1/4", 1 1/2"

STEEL SLOTTED CORE BOX VENTS
Slot widths: .010", .013", .015"
Diameters: 1/8", 3/16", 1/4", 5/16", 3/8", 7/16", 1/2", 5/8", 3/4", 7/8", 1", 1 1/4", 1 1/2"

SCREEN TYPE CORE BOX VENTS
Mesh: #30, #40, #50.
Diameters: 1/8", 3/16", 1/4", 5/16", 3/8", 7/16", 1/2", 5/8", 3/4", 7/8", 1", 1 1/4", 1 1/2"

SPECIFICATION CIRCULAR ON REQUEST

Wm. DEMMLER & Bros.
Kewanee, Illinois

ACCEPTED
BY AMERICA'S LARGEST INDUSTRIAL PLANTS TO DO THE TOUGHEST BLASTING AND PEENING OPERATIONS

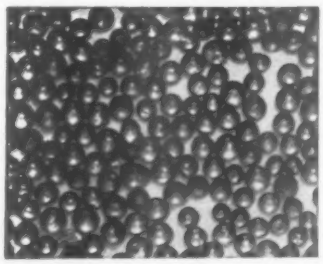
HI-GRADE METALLIC

FAMOUS
FOR ITS ABILITY TO STAND UP UNDER REPEATED HARD USE

SHOT AND GRIT

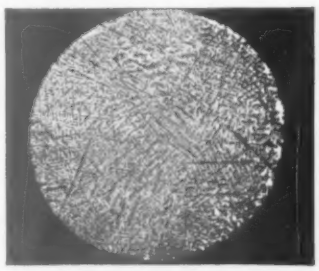
- ROUND
- UNIFORM IN SIZE
- UNIFORM IN HARDNESS
- LACKS IRREGULAR SHAPES

- RECTANGULAR
- SHARP
- TOUGH
- DURABLE



UNRETOUCHED PHOTO OF HI-GRADE SHOT

CLAYTON-SHERMAN ABRASIVES COMPANY
3896 LONYO ROAD
DETROIT 10, MICHIGAN
CEdar 7200

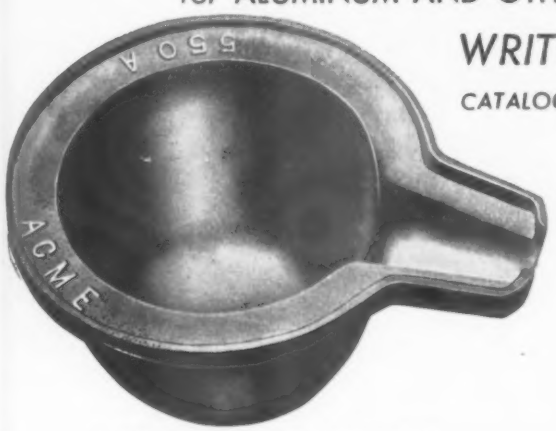


MICROSCOPIC STRUCTURE OF METAL

MELTING POTS—Ingot Molds

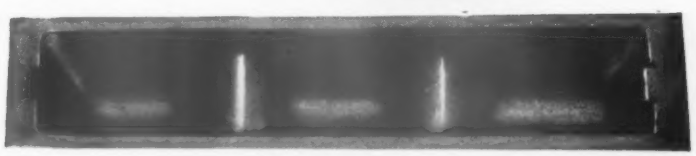
for ALUMINUM AND OTHER NONFERROUS METALS. 45 SIZES.

WRITE for CATALOG "F"



ROUND SPOUT POT NO. 550A WITH 1½" COLLAR ON FLANGE

HOLDING ——→ BOWL NO. HP7001



INGOT MOLD NO. AA-6

Made of Acme SPECIAL-M-Heat Resisting Iron — They Stand the Heat!

ACME FOUNDRY COMPANY
DETROIT 16, MICHIGAN
2502 TWENTY-SECOND ST. PHONE TASHMOO 5-2404

EVERYTHING FOR THE FOUNDRY
and we do mean "Everything!"

Those of you who are located in "The Heart of The Foundry Industry in The East..from the Carolinas to the Canadian line will find that "everything" just overnight away and priced, of course, for the thrifty.

PENNSYLVANIA FOUNDRY SUPPLY & SAND CO.
ASHLAND & EAST LEWIS STREETS
PHILADELPHIA 24 Telephone JE 5-1012

New CMC "DUMPOVER" PNEUMATIC TIRED CART

No deadweight to lift when dumping

Just tip as far as required and let contents fall out.

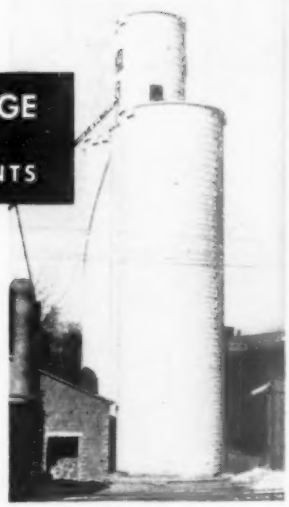
Chassis stays put when dumping

Built in 7 and 10 ft. sizes on pneumatics or interchangeable 30" steel wheels, for easier wheeling and easier dumping of foundry materials.

MIXERS • PUMPS • HOISTS
BATCHING & PLACING EQUIPMENT
RADIAL & TILT-TABLE SAWS

WRITE FOR FULL INFORMATION AND PRICES
CONSTRUCTION MACHINERY CO'S.
WATERLOO, IOWA

VERTICAL STORAGE THAT DEFIES THE ELEMENTS



Neff & Fry Bins Built For Little Elevator Co., Rockford, Ohio

During the last 32 years, Neff & Fry Storage Bins have withstood practically everything Nature offers . . . heat, cold, moisture, corrosion . . . even fire and storm. This is due to the stonelike properties of N & F Super-Concrete Staves, plus the erection technique.

The staves have matching grooved and beaded edges. Each stave interlocks with six adjacent ones. For contents which must be kept dry, dampproofing is accomplished by buttering the edges of the staves with mastic compound, coating the inside and outside of the bin with neat cement, and then adding two coats of waterproofing compound to the outside. To withstand internal pressure, the structure is bound with galvanized steel rings, as illustrated in the accompanying photograph.

If you are interested in storage bins which last for generations, get all the facts about Neff & Fry Super-Concrete Stave Bins. Complete information is yours for the asking. Write, wire, or phone.

THE NEFF & FRY COMPANY, CAMDEN, OHIO

NEFF & FRY STORAGE BINS

PROPER PLACING OF FLANGES

Assures Efficient Truscon Steel Flask Performance

The flanges and ribs of Truscon Steel Flasks are designed to help the molder, encouraging steadier production of better work. • The flange on the filling side of Truscon Steel Flasks is turned out to prevent interference with filling or shaking out. The flange on the bottom side or parting line is turned in, forming a sand strip to carry the sand. • There are many features like these built into the wide range of Truscon Steel Flasks — features of special importance in helping you develop better foundry practices. • Ask an experienced Truscon man to help you adapt Truscon Steel Flask advantages to your special needs. Write for illustrated catalog on Truscon Steel Flasks.

TRUSCON STEEL COMPANY

PRESSED STEEL DIVISION • 6100 TRUSCON AVENUE • CLEVELAND 4, OHIO

SUBSIDIARY OF REPUBLIC STEEL CORPORATION

T-M ALLOY STEEL CHAIN

STAYS STRONGER – LONGER!

TM Alloy Steel Chain has twice the tensile strength of low carbon steel or wrought iron chain. It never requires annealing or periodic heat treating. Its ability to withstand shock, its extreme hardness and its resistance to grain growth and work-hardness assure chain life five to fifteen times greater than ordinary chain. For chain that stays stronger—longer see your Mill Supply Distributor or write the S. G. Taylor Chain Co., 42 141st St., Hammond, Ind.

TAYLOR MADE Chain

75th ANNIVERSARY

MANUFACTURERS OF BBB, PROOF COIL, HI-TEST AND STEEL LOADING CHAIN

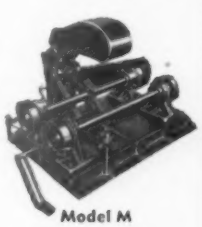
CENTRIFUGAL CASTING MACHINES

Model AS

These machines used to make ferrous and non-ferrous centrifugal castings are produced by the pioneer manufacturer of such equipment.

Model J

They are made in a large variety of styles and a wide range of sizes. Complete technical information is supplied concerning sand and permanent mold design, gating, sand mixes, speeds, etc.



Model M

Send us drawings or sketches of parts you are interested in casting centrifugally, and we will tell you, without obligation, if and how our machines can cast them faster, cleaner and with fewer rejects.

Model J-P

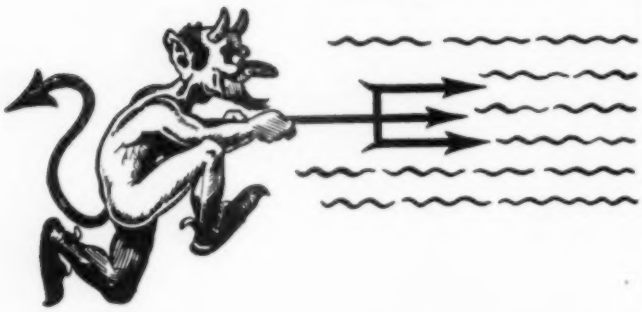
CENTRIFUGAL CASTING MACHINE COMPANY

Nathan Janco, *President*

P. O. Box 947 Tulsa 1, Okla.

SOFFEL'S THERMOTOMIC ABC

(Patents Pending)



A New Exothermic Feeding Compound for Aluminum and Magnesium Castings

★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★

THERMOTOMIC ABC is the first successful exothermic feeding compound ever to be developed for aluminum and magnesium castings. Results obtained from its use are amazing. Feeding metal in heads or risers is maintained in the fluid state from 20 to 30 minutes. Yield on aluminum castings has been greatly increased. Weight of feeding metal in heads or risers has been reduced by as much as 120% in many cases. Due to the restricted feeding neck through the THERMOTOMIC ABC core, the removal of feeding heads or risers is greatly facilitated.

THERMOTOMIC ABC is used as feeding ring cores under feeding heads or risers at their juncture with the casting. When the molten aluminum comes into contact with the exothermic ring core or insert, an exothermic chemical reaction takes place in the material which generates an intense heat. This heat serves to increase the temperature of the metal in the feeding head, thus assuring that it will remain fluid longer than the metal in the main body of the casting. As the casting cools and solidifies, the reservoir of feeding metal in the heads is free at all times to feed the casting and compensate for shrinkage occasioned by solidification. Since, by the use of THERMOTOMIC ABC, it is possible to control directional solidification in the casting, chills may be eliminated. Thin sections will feed from heavier sections; which in turn will feed from the feeding heads or risers. As the feeding heads or risers are kept liquid by the exothermic action of the THERMOTOMIC ABC, it is readily seen how this use of THERMOTOMIC ABC will eliminate shrink cracks and pipe in castings caused by premature freezing of the feeding metal.

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SOFFEL'S AL-X31 LIQUIDIZER

(Patents Pending)

An Exothermic Feeding Head Compound and Pipe Eliminator For Aluminum and Magnesium Castings.

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SOFFEL'S AL-X31 LIQUIDIZER was developed for use in conjunction with THERMOTOMIC ABC. In order to secure best results and maximum feeding, we strongly recommend that AL-X31 LIQUIDIZER be applied on the feeding heads or risers. When so applied, AL-X31 LIQUIDIZER enters into an intense exothermic action which will actually raise the temperature of the feeding metal. The heat produced is sufficiently great that, even if the metal has solidified, it will re-melt. After AL-X31 LIQUIDIZER has completed its exothermic action, it forms a soft, insulating cover on the feeding metal. This cover confines the heat generated and further delays solidification of the feeding heads or risers.

NOTE: Neither THERMOTOMIC ABC nor AL-X31 LIQUIDIZER will contaminate or otherwise injure the metal in any way.

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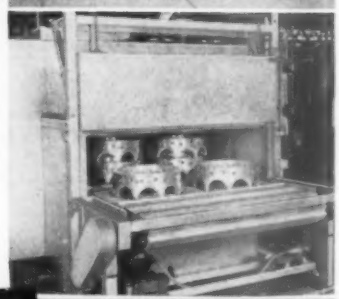

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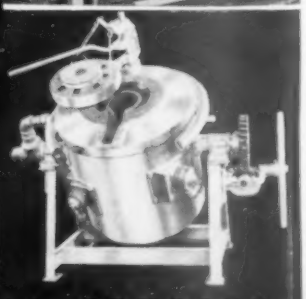

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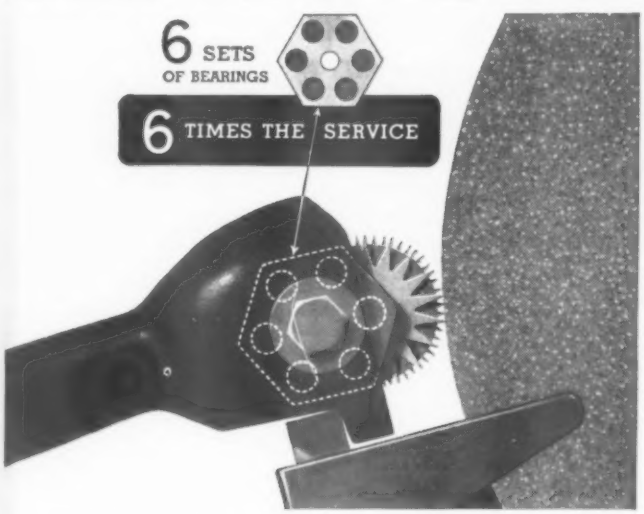

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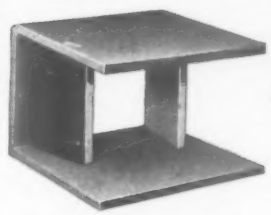

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STATEMENT OF OWNERSHIP

Statement of the ownership, management, circulation, etc., required by the Act of Congress of Aug. 24, 1912, as amended by the acts of March 3, 1933, and July 2, 1946 of The Foundry, published monthly at Cleveland, O., for Oct. 1, 1948. State of Ohio, County of Cuyahoga, ss. Before me, a notary public in and for the state and county aforesaid, personally appeared George O. Hays, who, having been duly sworn according to law, deposes and says that he is the Business Manager of THE FOUNDRY, and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management, etc., of the aforesaid publication for the date shown in the above caption, required by the act of Aug. 24, 1912, as amended by the acts of March 3, 1933, and July 2, 1946 (section 537, Postal Laws and Regulations), printed on the reverse of this form, to wit: 1.—That the names and addresses of the publisher, editor, managing editor, and business manager are: Publisher, The Penton Publishing Co., 1213 West Third St., Cleveland 13, Ohio. Editor, Frank G. Steinebach, 1213 West Third St., Cleveland 13, Ohio. Managing editor, William G. Gude, 1213 West Third St., Cleveland 13, Ohio. Business manager, George O. Hays, 1213 West Third St., Cleveland 13, Ohio. 2.—That the owner is The Penton Publishing Company, Cleveland, Ohio. Names and addresses of stockholders owning or holding 1 per cent or more of the total amount of stock: Edwin C. Barringer, Washington, D. C.; Samuel E. Bool, Cleveland, Ohio; Richard M. Bourne, Cleveland, Ohio; County National Bank of Santa Barbara, Santa Barbara, Calif.; J. R. Dawley, Cleveland, Ohio; Ernest C. Dempsey, Richard Inglis & Central National Bank of Cleveland as Trustees under agreement with John A. Penton dated Feb. 16, 1924, Cleveland, Ohio; The Fanner Manufacturing Co., Cleveland, Ohio; Agnes T. Hays, Cleveland, Ohio; George O. Hays, Cleveland, Ohio; Russell C. Jaenke, Cleveland, Ohio; S. H. Jasper, Pittsburgh, Pa.; A. L. Klingeman, Cleveland, Ohio; E. C. Kreutzberg, Washington, D. C.; Parness & Co., Cleveland, Ohio; J. D. Pease, Mount Dora, Florida; L. E. Penton, Los Angeles, Calif.; E. L. Shaner, Cleveland, Ohio; Charles J. Stark, Cleveland, Ohio; Penelope M. Stark, Cleveland, Ohio; E. L. Werner, Cleveland, Ohio; Grace Whelan, Santa Barbara, Calif. 3.—That the known bondholders, mortgagees and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are: None. 4.—That the two paragraphs next above, giving the names of the owners, stockholders and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustee, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him. Geo. O. Hays. Sworn to and subscribed before me this 23rd day of September, 1948. (Seal) R. W. Coleman. (My commission expires Dec. 26, 1950.)

HELPFUL LITERATURE

NOTE TO READERS: If you will check the item or items described which particularly interest you, we will be glad to request the manufacturers concerned to send you their literature. Use the attached postal card.

1. Foundry Flasks

Industrial Fabricating Co.—12-page illustrated foundry equipment catalog No. 5-48 contains construction details, specifications and other data on complete range of sizes and styles of foundry flasks for hand as well as machine molding operations. Accessories described include stub pins and bushings, flask pins, pins and pin lugs, steel jackets, bottom boards and flask upsets.

2. Pneumatic Vibrators

Cleveland Vibrator Co.—12-page illustrated catalog No. 104 presents technical data and application information on complete line of pneumatic vibrators for use on molding machines, materials handling bins, shakeouts and annealing pots. Accessories such as hose fittings, operating valves and automatic lubricator are described also.

3. Drive Chains

Jeffrey Mfg. Co.—60-page illustrated catalog No. 808 presents pertinent information on steel thimble roller drive chains for every class of service. Manufacturing technique, available types of drive chains, horsepower ratings, sprockets and typical applications are some of the subjects covered.

4. Foundry Instruments

Illinois Testing Laboratories, Inc.—4-page illustrated condensed catalog No. 2929 is entitled "Alnor Instruments for Foundry Service." Detailed descriptions are included on all types of pyrometers, electrical resistance thermometers and direct-reading air velocity meters. These instruments are designed specifically to withstand foundry operating conditions and to afford accurate measurements.

5. Grinding Wheels

Macklin Co.—84-page illustrated catalog No. E-46 tabulates specifications and prices as well as application information on complete line of grinding wheels which includes vitrified and resinoid bond types in all standard sizes and shapes. Special types of abrasive products such as segments, rubbing bricks, sticks and core files are included.

6. Goggles & Respirators

American Optical Co.—Two illustrated 1-page data sheets describe No. 705 Super-Vent goggle which prevents fogging and steaming in humid atmospheres and has wide-angle shatter-resistant acetate lens and No. R-29000 respirator which is designed to combat nuisance dusts.

7. Electrode Guide

Air Reduction Sales Co.—36-page illustrated "Pocket Guide to Airco Electrodes" lists mechanical properties, typical analyses, application, electrode number and type of work for various electrodes to aid in selection of proper type to obtain any desired result.

8. Abrasive Belt Machines

Porter-Cable Machine Co.—20-page illustrated "Miniature Catalog" describes complete line of abrasive belt machines as well as portable electric tools such as sanders, saws, edgers and radial woodworking saws. Large abrasive belt machine tools as well as small bench models and backstand idlers are covered.

9. Vacuum Equipment

Spencer Turbine Co.—20-page illustrated bulletin No. 144 is entitled "132 Unusual Uses for Spencer Vacuum." Applications described range from removal of liquids, gases, precious metals and dusts to use of vacuum as conveyor of materials at rates up to 4 tons per hour.

10. Low Temperature Welding

Eutectic Welding Alloys Corp.—8-page illustrated publication "The Eutectic Welder" shows how low temperature welding alloys can be used to advantage in welding all types of ferrous and nonferrous materials. Data are included on new Cuttrode cutting electrode which cuts metal without using special equipment or oxygen.

11. Foundry Accessories

Interstate Pattern & Machine Co.—4-page illustrated bulletin shows application of Peterson Holiner which insures seal between core box and blow plate on core machines. These rubber bushings stop blow plate abrasion and are easy to use.

12. Motorized Wheelbarrow

Kwik-Mix Co.—2-page illustrated specification sheet presents details on small gasoline engine-driven wheelbarrow which handles up to 12 cubic feet of material at speeds of 2 to 4 miles per hour. Features include automatic load dumping, pneumatic tires and double-acting clutch.

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13. Magnetic Separators

Dings Magnetic Separator Co.—2-page illustrated data sheet No. B-1009-A lists special features, typical applications and specifications of new Alnico Perma-Pulley magnetic separator. These nonelectric pulley type separators are designed for automatic separation of magnetic and nonmagnetic dry materials.

14. Sand Rammers

Rotor Tool Co.—4-page illustrated bulletin No. 32 describes complete line of Powerplus sand rammers which includes types for light bench and core work, light ramming in deep flasks, medium bench and molding machine operations, light floor molding, heavy bench ramming and floor molding.

15. Pig Iron

Jackson Iron & Steel Co.—20-page illustrated booklet "This Little Pig Went To Market" deals with Jisco Silvery pig iron. Material is used in steel, gray and malleable iron castings. Controlled production is covered.

16. Blast Cleaning Abrasive

Cleveland Metal Abrasive Co.—8-page illustrated bulletin No. 48 gives sizes and tolerances as well as application data on both cleaning grit and cleaning shot. Manufacturing facilities, company personnel and sales representatives are listed.

17. Conveyors & Accessories

Palmer-Bee Co. — 36-page illustrated condensed catalog on conveyors for the foundry is entitled "That New Look." Detailed descriptions are given on Lubricated-for-Life belt conveyor idlers, foundry mold conveyors and other types. Actual installation views are shown of various types of foundry materials handling set-ups.

18. Rollover Machines

Tabor Mfg. Co.—12-page illustrated bulletin No. 454 presents specifications and details of hand-ram, rollover, pattern draw machines; rollover, draw core machines; jar, rollover, pattern draw machines of hinged and trunnion types; and jar, squeeze, rollover, pattern draw machines.

19. Electric Furnace

Detroit Electric Furnace Div., Kuhlman Electric Co.—4-page illustrated bulletin "A New Degree of Control" shows advantages obtainable through use of rocking type electric furnaces. Performance charts of typical furnaces in various plants are included.

20. Mounted Wheels & Points

A. P. de Sanno & Son, Inc.—24-page illustrated booklet "Radiac Mounted Points and Mounted Wheels" shows standard shapes and sizes, includes prices and lists grades and grain sizes for these products.

21. Chaplets

Cleveland Chaplet & Mfg. Co.—12-page illustrated bulletin No. 48 charts sizes and prices for shoulder radiator, plate head radiator, motor, button or boiler wrought iron forged single-head chaplets and double-head chaplets. Also covered are perforated chaplets.

22. Diecasting Machine

Cleveland Automatic Machine Co.—4-page ilustrated folder "Cleveland Universal High-Pressure Hydraulic Diecasting Machine" deals with model No. 200 machine developed for use with aluminum, magnesium or brass. Simple change of hot-metal end equips unit for casting zinc, tin or lead.

23. Testing Equipment

Detroit Testing Machine Co.—Illustrated data sheet "Testing Tensile, Transverse and Compression" provides charted specifications, lists standard equipment and describes tensile testing machine having 30,000-pound capacity. Load is applied hydraulically by means of gear pump of rotary type.

24. Alloy Welding Electrodes

Arcos Corp.—4-page illustrated data bulletin "Arcos Products for Welding Stainless and Alloy Steels" lists types, applications, numbers, recommended current and other data on stainless, low alloy and nonferrous electrodes; bare wire; and cutting electrodes. Types for use in alloy casting foundries are covered in detail.

25. Grinding Wheels

Cleveland Quarries Co., Sterling Grinding Wheel Div.—4-page illustrated folder "The Wheels of Industry" provides specifications of cutoff and snagging wheels for use on stand, swing frame and portable equipment. Charts reveal information on types of wheels for use with various materials and recommend speed of operation.

26. Foundry Equipment

Newaygo Engineering Co.—8-page illustrated bulletin No. 204 contains brief descriptions of such foundry equipment as sand handling systems, mold conveyors, turn-tables, rotary plate feeders, sand coolers and aerators, core crushers, sand conditioners, core drawing machines and floor line markers. Pictures of actual installations of various types of equipment are included.

27. Truck Cranes

Orton Crane & Shovel Co.—16-page illustrated bulletin No. 62 is descriptive of new line of truck cranes which are available in three sizes to meet practically all requirements of foundry. General dimensions and working capacities are charted, and discussions cover speed of operation, control and service life. Pneumatic or solid tires can be supplied.

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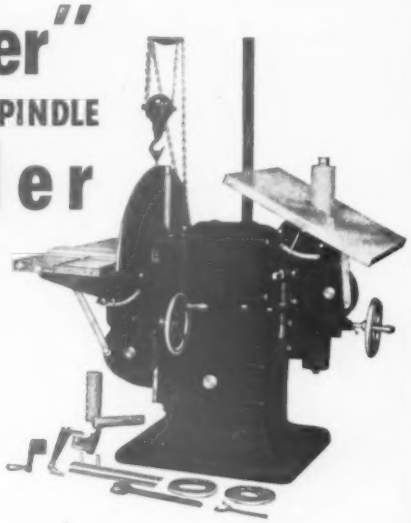

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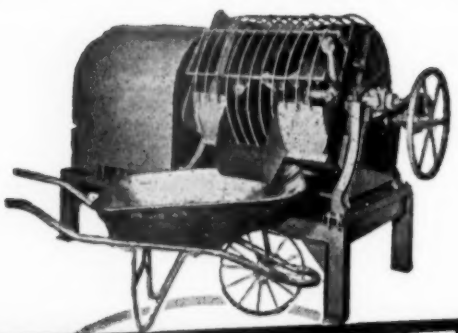

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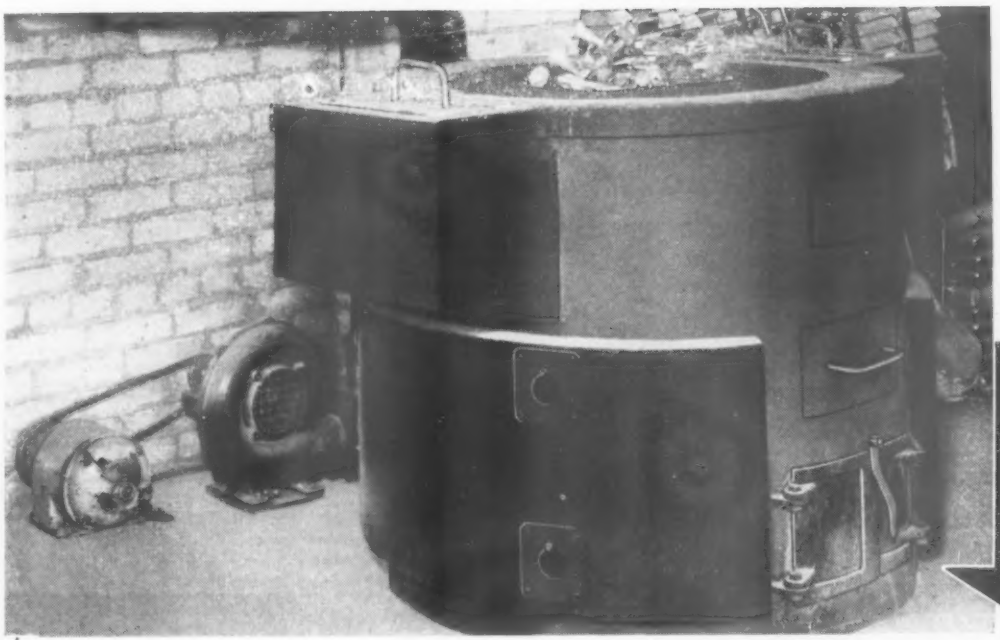

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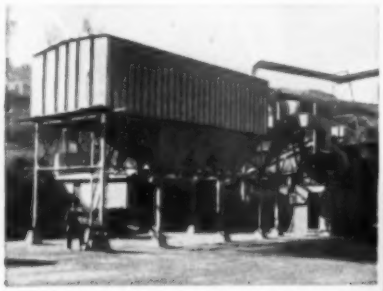

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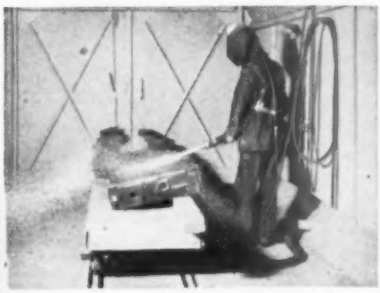

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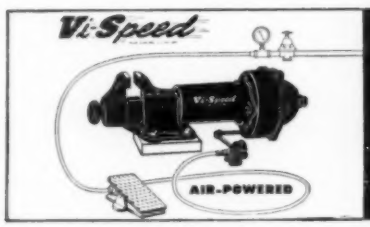

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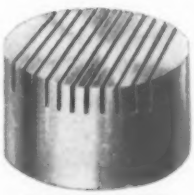

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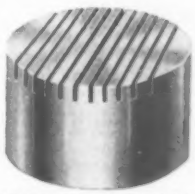

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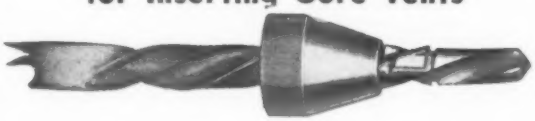

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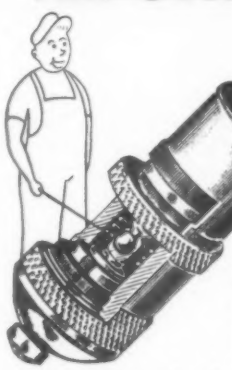

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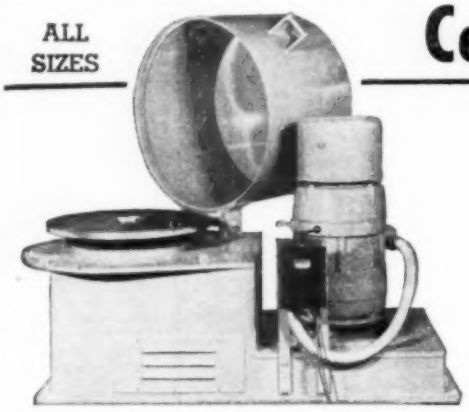

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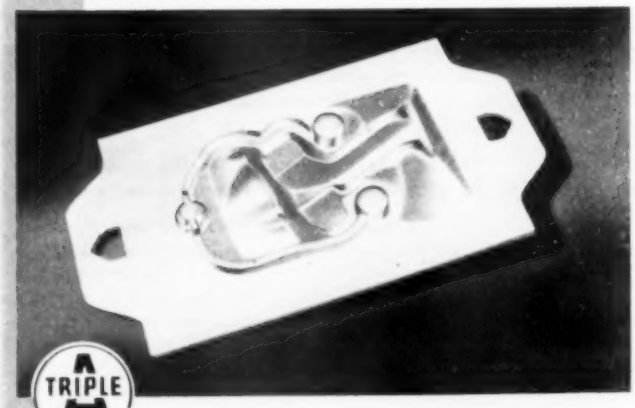

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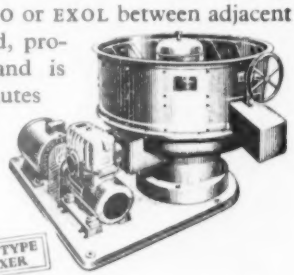

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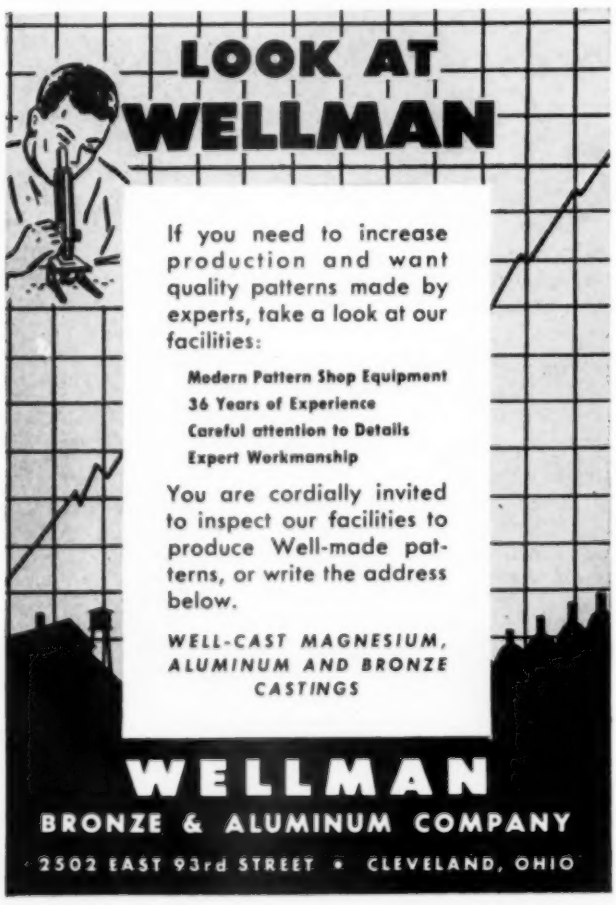

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Jeffrey Mfg. Co., 907 N. Fourth St., Columbus 16, O.
National Engineering Co., 549 W. Washington St., Chicago 6, Ill.
Screen Equipment Co., Buffalo 21, N. Y.
Simplicity Engineering Co., Durand, Mich.

SCREENS (Vibrating)

Allis-Chalmers Mfg. Co., Milwaukee 1, Wis.
Ajax Flexible Coupling Co., Westfield, N. Y.
Link Belt Co., 300 W. Pershing Rd., Chicago 9, Ill.
Robins Conveyors, Inc., 70 Pine St., New York 5, N. Y.
Screen Equipment Co., Buffalo 21, N. Y.
Simplicity Engineering Co., Durand, Mich.

SEA COAL

Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.
Smith Facing & Supply Co., 1857 Carter Rd., Cleveland 13, O.
Frederic B. Stevens, Inc., Detroit 16, Mich.

SEPARATORS (Abrasive)

American Wheelabrator & Equipment Co., Mishawaka, Ind.
Pangborn Corp., Hagerstown, Md.

SEPARATORS (Air, Moisture, Oil)

American Air Filter Co., Louisville 8, Ky.
American Wheelabrator & Equipment Co., Mishawaka, Ind.
Chicago Mfg. & Distributing Co., 1928 W. 46th St., Chicago 9, Ill.
Dollinger Corp., 36 Centre Park, Rochester 4, N. Y.
Jas. A. Murphy & Co., Hamilton, O.
Pangborn Corp., Hagerstown, Md.

SEPARATORS (Magnetic)

Beardsley & Piper Co., 2424 N. Cicero, Chicago 39, Ill.
Dings Magnetic Mfg. Co., 4740 W. McGeough, Milwaukee 7, Wis.
National Engineering Co., 549 W. Washintgon St., Chicago 6, Ill.
Stearns Magnetic Mfg. Co., 662 S. 28th St., Milwaukee 4, Wis.

SHAKE-OUT MACHINERY

Allis-Chalmers Mfg. Co., Milwaukee 1, Wis.
American Air Filter Co., Louisville 8, Ky.
C. O. Bartlett & Snow Co., 6201 Harvard Ave., Cleveland 5, O.
Beardsley & Piper Co., 2424 No. Cicero, Chicago 39, Ill.
Herman Pneumatic Machine Co., Union Bank Bldg., Pittsburgh 22, Pa.
Link Belt Co., 300 W. Pershing Rd., Chicago 9, Ill.
New Haven Vibrator Co., 131 Chestnut St., New Haven 7, Conn.
Robins Conveyors, Inc., 70 Pine St., New York 5, N. Y.
Royer Foundry & Machine Co., Kingston, Pa.
Simplicity Engineering Co., Durand, Mich.

SHAKEOUT MACHINE MOUNTING PADS

Fabreeka Products, Inc., 222B Summer St., Boston, Mass.

SHOCK ABSORBING PADS

Fabreeka Products, Inc., 222B Summer St., Boston, Mass.

SHOT AND GRIT

Alloy Metal Abrasive Co., 311 W. Huron St., Ann Arbor, Mich.
American Wheelabrator & Equipment Co., Mishawaka, Ind.
American Steel Abrasives Co., Galion, O.
Carpenter Brothers, Inc., 606 West Wisconsin, Milwaukee 3, Wis.
Clayton Sherman Abrasives Co., 3896 Lonyo Rd., Detroit 10, Mich.
Cleveland Metal Abrasive Co., 887 E. 67th St., Cleveland, Ohio.
Globe Steel Abrasive Co., Mansfield, O.
Hickman-Williams & Co., Union Commerce Bldg., Cleveland 14, O.
Metal Blast, Inc., 871 E. 67th St., Cleveland, Ohio.
National Metal Abrasive Co., 3560 Norton Ave., Cleveland 7, O.
Pangborn Corp., Hagerstown, Md.
Pittsburgh Crushed Steel Co., Pittsburgh 1, Pa.
Pennsylvania Foundry Supply & Sand Co., Ashland & E. Lewis Sts., Philadelphia 24, Pa.
George Pfaff Inc., 11-61 Jackson Ave., Long Island City, N. Y.
Sly Mfg. Co., W. W., 4753 Train Ave., Cleveland 2, O.
Steel Shot & Grit Co., Inc., 39 Warren Ave., Boston, Mass.

SHOT (Peening)

Alloy Metal Abrasive Co., 311 W. Huron St., Ann Arbor, Mich.
American Wheelabrator & Equipment Co., Mishawaka, Ind.
American Steel Abrasives Co., Galion, O.
Cleveland Metal Abrasive Co., 887 E. 67th St., Cleveland, Ohio.
Globe Steel Abrasive Co., Mansfield, Ohio.
Metal Blast, Inc., 871 E. 67th St., Cleveland, Ohio.
National Metal Abrasive Co., 3560 Norton Ave., Cleveland 7, O.
Pittsburgh Crushed Steel Co., Pittsburgh 1, Pa.
Steel Shot & Grit Co., Inc., 39 Warren Ave., Boston, Mass.

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Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.
Frederic B. Stevens, Inc., Detroit 16, Mich.

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Clark Industrial Truck Div. of Clark Equipment Co., Battle Creek, Mich.

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Federal Foundry Supply Co., 4600 East 71st St., Cleveland 5, Ohio.
Standard Silica Corp., 209 So. LaSalle St., Chicago 4, Ill.
Wedron Silica Co., 38 So. Dearborn St., Chicago, Ill.

SILICOMANGANESE

Electro Metallurgical Sales Corp., 30 E. 42nd St., New York 17, N. Y.

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Chicago Mfg. & Distributing Co., 1928 W. 46th St., Chicago 9, Ill.
Tamms Silica Co., 228 N. LaSalle St., Chicago 1, Ill.

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Gardner-Denver Co., Quincy, Ill.
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National Engineering Co., 549 W. Washington St., Chicago 6, Ill.
Whiting Corporation, 15607 Lathrop Ave., Harvey, Ill.

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Adams Co., Dubuque, Iowa.
Hines Flask Co., 3431 W. 140th St., Cleveland 11, Ohio.

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Link Belt Co., 300 W. Pershing Rd., Chicago 9, Ill.
S. G. Taylor Chain Co., Hammond, Ind.

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Chicago Mfg. & Distributing Co., 1928 W. 46th St., Chicago 9, Ill.
Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.
Fremont Flask Co., Fremont, O.
Hines Flask Co., 3431 W. 140th St., Cleveland 11, Ohio.

SMELTERS & REFINERS

Federated Metals Div. American Smelting and Refining Co., 120 Broadway, New York 5.
R. Lavin & Sons Inc., 3426 S. Kedzie Ave., Chicago 23, Ill.
Niagara Falls Smelting & Refining Div., Continental-United Industries Co., Inc., 2204 Elmwood Ave., Buffalo 17, N. Y.

SNAGGING WHEELS—See ABRASIVE WHEELS

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Adams Co., Dubuque, Iowa.
Diamond Clamp & Flask Co., Richmond, Ind.
Federal Foundry Supply Co., 4600 East 71st St., Cleveland 5, Ohio.
Hines Flask Co., 3431 W. 140th St., Cleveland 11, Ohio.

SODA ASH

Federal Foundry Supply Co., 4600 East 71st St., Cleveland 5, Ohio.
Hercules Powder Co., Wilmington 99, Del.
Mathieson Chemical Corp., 60 E. 42nd St., New York 17, N. Y.

SOLDER

Federated Metals Div. American Smelting and Refining Co., 120 Broadway, New York 5.

SPACE HEATERS

Dravo Corp., Dravo Bldg., Pittsburgh 22, Pa.

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Murphy & Co., Jas. A., Hamilton, O.
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SPRUE CUTTERS

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Federal Foundry Supply Co., 4600 East 71st St., Cleveland 5, Ohio.
Milwaukee Chaplet & Mfg. Co., 1023 S. 40th St., Milwaukee, Wis.

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American Bridge Co., Pittsburgh 19, Pa.

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Adams Co., Dubuque, Iowa.
Champion Foundry & Machine Co., 1553 West Madison St., Chicago 7, Ill.
Davenport Machine & Foundry Co., Davenport, Iowa.
International Molding Machine Co., LaGrange Park, Ill.
Milwaukee Foundry Equipment Co., 3228 W. Pierce St., Milwaukee, Wis.

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N. Ransohoff, Inc., 208 W. 71st St., Cincinnati 16, O.

TAPER PINS

Standard Horse Nail Corp., New Brighton, Pa.

TEMPERATURE CONTROLLERS

Brown Instrument Co. Div. Minneapolis-Honeywell Regulator Co., 4462 Wayne Ave., Philadelphia 44, Pa.
Foxboro Company, Foxboro, Mass.
Illinois Testing Laboratories, 418 N. LaSalle St., Chicago 10, Ill.
Marshall Co., L. H., 270 W. Lane Columbus 1, O.

TESTING EQUIPMENT

Detroit Testing Machine Co., 19390 Grinnell Ave., Detroit 13, Mich.

TESTING LABORATORIES

Harry W. Dietert Co., 9330A Roselawn Ave., Detroit 4, Mich.

TESTING MACHINERY

W. C. Dillon & Co. Inc., 5410 W. Harrison St., Chicago 44, Ill.

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Illinois Testing Laboratories, 418 N. LaSalle St., Chicago 10, Ill.
Marshall Co., L. H., 270 W. Lane, Columbus 1, O.
Pyrometer Instrument Co., Bergenfield, N. J.
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Clark Industrial Truck Div. of Clark Equipment Co., Battle Creek, Mich.

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Federated Metals Div.
American Smelting and Refining Co., 120 Broadway, New York 5, N.Y.

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Industrial Equipment Co., Minster, O.

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Severance Tool Industries Inc., Saginaw, Mich.

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TOOLS (Pneumatic Portable)

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Dayton Pneumatic Tool Co., Dayton 1, O.
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Gardner-Denver Co., Quincy, Ill.
Independent Pneumatic Tool Co., Aurora, Ill.
Ingersoll-Rand Co., 11 Broadway, New York 4, N. Y.
Joy Mfg Co., Sullivan Division, Michigan City, Ind.
Schramm Inc., West Chester, Pa.

TORCHES and BURNERS (Acetylene, gas, oil)

Linde Air Products Co., 30 E. 42nd St., New York 17.
North American Mfg. Co., 4455 E. 71st St., Cleveland 4, O.

TOTE BOXES (see "BOXES-TOTE")

TRACTOR (Gas Powered)

Clark Industrial Truck Div. of Clark Clark Equipment Co., Battle Creek, Mich.

TRADE ASSOCIATIONS

Crucible Manufacturers Association, 90 West St., New York 6, N. Y.
Gray Iron Foundres Society Inc., 1010 Public Square Bldg., Cleveland 13, Ohio.

TRAMRAIL SYSTEMS

American MonoRail Co., 13104 Athens Ave., Cleveland 7, O.
Cleveland Tramrail Div. of Cleveland Crane & Engineering Co., 1155 East 283rd St., Wickliffe, O.
Link Belt Co., 300 W. Pershing Rd., Chicago 9, Ill.
Modern Equipment Co., Port Washington, Wis.

TROLLEYS

Curtis Pneumatic Machinery Co., 1922 Kienlen Ave., St. Louis 20, Mo.
Modern Equipment Co., Port Washington, Wis.

TRUCK BATTERIES (Industrial)

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TRUCK WHEELS

Sterling Wheelbarrow Co., 7100 W. Walker St., Milwaukee 14, Wis.

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Foundry Equipment Co., 1831 Columbus Rd., Cleveland 13, Ohio.

TRUCKS (Power Lift)

Clark Industrial Truck Div. of Clark Clark Equipment Co., Battle Creek, Mich.

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Pressed Steel Co., Wilkes-Barre, Pa.

TUBES (X-Ray)

General Electric X-Ray Corp., 4855 West McGeoch Ave., Milwaukee 14, Wis.

TUMBLING BARRELS

Haynes Foundry Equipment Co., 814 Ada St., Kalamazoo 21, Mich.
N. Ransohoff Inc., 208 W. 71st St., Cincinnati 16, O.
Sly Mfg. Co., W. W., 4753 Train Ave., Cleveland 2, O.
Tabor Mfg. Co., 6225 Tacony St., Philadelphia 35, Pa.
Whiting Corporation, 15607 Lathrop Ave., Harvey, Ill.

TURNTABLES

Beardsley & Piper Co., The, 2424 No. Cicero, Chicago 39, Ill.
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Newaygo Engineering Co., Newaygo, Mich.
Whiting Corporation, 15607 Lathrop Ave., Harvey, Ill.

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Cleveland Vibrator Co., 2828 Clinton Ave., W., Cleveland 13, Ohio.
Dallett Co., 165 West Clearfield, Philadelphia, Pa.
North American Mfg. Co., 4455 E. 71st St., Cleveland 4, O.

VALVES (Adjustable Orifice)

North American Mfg. Co., 4455 E. 71st St., Cleveland 4, Ohio.

VALVES (Blow-off and Cut-off)

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Cleveland Vibrator Co., 2828 Clinton Ave., W., Cleveland 13, Ohio.
Wm. H. Nichols Co., Richmond Hill, Long Island 18, N. Y.

VALVES (Oxygen, Acetylene)

Linde Air Products Co., 30 E. 42nd St., New York 17, N. Y.

VENTILATORS (Roof)

Swartwout Co., 18511 Euclid Ave., Cleveland 15, Ohio.

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American Wheelabrator & Equipment Co., Mishawaka, Ind.
Joy Mfg. Co., La-Del Division, New Philadelphia, Ohio.
Newcomb-Detroit Co., Inc., 5741 Russell St., Detroit 11, Mich.
Pangborn Corp., Hagerstown, Md.
Propellair Inc., Springfield, Ohio.
Ross Engineering Corp., J. O., 350 Madison Ave., New York 17, N.Y.
Schneible Co., Claude B., 2827—25th St., Detroit 16, Mich.
Swartwout Co., 18511 Euclid Ave., Cleveland 15, Ohio.

VENTILATING SYSTEMS (Cont'd.)

W. W. Sly Mfg. Co., 4753 Train Ave., Cleveland 2, O.
Westinghouse Electric Corp., B. F. Sturtevant Div., 40 Wall St., New York 4, N. Y.

VENTS (Core Box)

Champion Foundry & Machine Co., 1314 W. 21st St., Chicago 8, Ill.
Demmler & Bros., Wm., Kewanee, Ill.
C. M. Smillie & Co., 1100 Woodward Hgts. Blvd., Ferndale, Mich.
Landis Mfg. Co., 2305 Hilton Rd., Ferndale, Mich.

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Fabreeka Products, Inc., 222B Summer St., Boston, Mass.

VIBRATORS

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Beardsley & Piper Co., 2424 No. Cicero, Chicago 39, Ill.
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Cleveland Vibrator Co., 2828 Clinton Ave., W., Cleveland 13, Ohio.
Davenport Machine & Foundry Co., Davenport, Iowa.
Dallett Co., 165 West Clearfield, Philadelphia, Pa.
Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.
Foundry Supplies & Mfg. Co., 2221 Orchard St., Chicago 14, Ill.
Freeman Supply Co., 1152 Broadway, Toledo 5, O.
Herman Pneumatic Machine Co., Union Bank Bldg., Pittsburgh 22, Pa.
Link Belt Co., 300 W. Pershing Rd., Chicago, Ill.
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Milwaukee Foundry Equipment Co., 3238 W. Pierce St., Milwaukee, Wis.
New Haven Vibrator Co., 131 Chestnut St., New Haven 7, Conn.
Nichols Co., Wm. H., Richmond Hill, Long Island 18, N. Y.
Osborn Mfg. Co., 5401 Hamilton Ave., Cleveland 14, O.
S P O Incorporated, 7500 Grand Division Ave., Cleveland 5, O.
Syntron Company, Homer City, Pa.
Tabor Mfg. Co., 6225 Tacony St., Philadelphia 35, Pa.

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VISES (Air Operated)

Van Products Co., Erie, Pa.

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Bradley Washfountain Co., Box 732, Milwaukee 1, Wis.

WAX (Core, Vent, Pattern)

United Compound Co., Inc., 328 South Park Ave., Buffalo 4, N. Y.

WAX (Precision Casting)

Halowax Products Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York 17, N. Y.

WEDGES (Foundry)

Chicago Mfg. & Distributing Co., 1928 W. 46th St., Chicago 9, Ill.
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Harnischfeger Corp., 4411 W. National Ave., Milwaukee 14, Wis.
Lide Air Products Co., 30 E. 42nd St., New York 17, N. Y.
Westinghouse Electric Corp., Pittsburgh 30, Pa.

WELDING and CUTTING APPARATUS and SUPPLIES

Linde Air Products Co., 30 E. 42nd St. New York 17, N. Y.

WELDING ELECTRODES (Carbon)

National Carbon Co., Carbon Products Div., 30 E. 42nd St., New York 17, N. Y.

WELDING RODS & ELECTRODES

International Nickel Co., Inc., 67 Wall St., New York 5, N. Y.
Linde Air Products Co., 30 E. 42nd St., New York 17, N. Y.

WHEELBARROWS

Sterling Wheelbarrow Co., 7100 W. Walker St., Milwaukee 14, Wis.

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Electro Refractories & Alloys Corp., Vars Bldg., Buffalo 2, N. Y.
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Raybestos Manhattan, Inc., Manhattan Rubber Division, Passaic, N. J.
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Sterling Grinding Wheel Division, Cleveland Quarries Co., Tiffin, Ohio.

WHEELS (Wire)

Osborn Mfg. Co., 5401 Hamilton Ave., Cleveland 14, O.

WIRE BENDERS

Redford Iron & Equipment Co., 21315 W. McNichols Rd., Detroit, Mich.

WIRE BRUSHES

Independent Pneumatic Tool Co., Aurora, Ill.
Osborn Mfg. Co., 5401 Hamilton Ave., Cleveland 14, O.

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Federal Foundry Supply Co., 4600 East 71st St., Cleveland 5, Ohio.
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Freeman Supply Co., 1152 Broadway, Toledo 5, O.
Oliver Machinery Co., Grand Rapids 2, Mich.
Parks Woodworking Machine Co., 1546 Knowlton St., Cincinnati 23, Ohio.

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Allis-Chalmers Mfg. Co., Milwaukee 1, Wis.
General Electric X-Ray Corp., 4855 West McGeoch Ave., Milwaukee 14, Wis.
Westinghouse Electric Corp., Pittsburgh 30, Pa.

X-RAY FILMS

Eastman Kodak Co., Rochester, N. Y.
General Electric X-Ray Corp., 4855 West McGeoch Ave., Milwaukee 14, Wis.

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Experienced man for supervision of core room in the making of large and small cores for grey iron production foundry. Completely modern facilities for bench, air-machine and rollover work. Man selected must be thoroughly familiar with all phases of coremaking. Advancement assured the man with ability. A progressive firm located in the Middle West. State experience, personal data and salary expected in first letter. Address: Box 301, The FOUNDRY, Cleveland 13, Ohio.

FOUNDRY SUPERINTENDENT

In established Ohio nonferrous foundry. Thoroughly experienced in every phase of brass, bronze, and aluminum production, including melting, core, pattern, and molding departments. Capable of setting piece work rates and quoting on casting work.
Must be active and know how to direct experienced foremen. Good working conditions, permanent position and satisfactory salary assured to right man.
Give full particulars and salary expected in first letter.

Box 284
The FOUNDRY Cleveland 13, Ohio

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EXCEPTIONAL OPPORTUNITY

FOR

THOROUGHLY CAPABLE MAN

Well established modern foundry in New England with reputation for high quality castings. Capacity 50-60 tons melt per day ranging from light bench work to pieces weighing several tons. Replies held in strict confidence.

BOX 292

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Established and growing foundry equipment manufacturer has opening for aggressive salesman experienced in foundry equipment sales. A real opportunity for the right man.

BOX 279

The FOUNDRY CLEVELAND 13, OHIO

MOLDING FOREMAN

Man needed to supervise molders in large mechanized grey iron foundry making small and medium sized castings. Works includes squeezers, bench, molding machines, etc. Excellent opportunity for advancement with long established firm located in Middle West. Give full work experience, personal data and salary expected in first letter. Address: Box 300, The FOUNDRY, Cleveland 13, Ohio.

FOREMAN

New Jersey grey iron foundry. Job producing 10 to 10,000 lbs. pressure castings. Must be good organizer and director with knowledge of cupola practice, sand control, rigging for production in molding and coreroom. State age, experience and salary required. Address: Box 287, The FOUNDRY, Cleveland 13, Ohio.

SALESMAN

Thoroughly experienced in sale of gray iron and semi steel castings, light to heavy, preferably with foundry experience and good contacts in Eastern Pennsylvania, New Jersey and vicinity. Good opportunity. State age, experience and salary wanted. Address: Box 253, The FOUNDRY, Cleveland 13, Ohio.

METALLURGIST

Metallurgist capable of operating induction ferrous furnace. Location middlewest. Address: Box 218, The FOUNDRY, Cleveland 13, Ohio.

Help Wanted

FOUNDRY FOREMAN

For gray iron, brass, bronze and aluminum jobbing shop in Eastern Georgia. Must be capable of taking complete charge of foundry operations. Submit experience, age, references and salary desired. Address: Box 268, The FOUNDRY, Cleveland 13, Ohio.

PRODUCTION MANAGER

Wanted for nonferrous foundry and machine shop for plant located in Southern Michigan.

BOX 281

The FOUNDRY Cleveland 13, Ohio

WANTED

Men capable of operating brass and aluminum smelting plant. Require man with experience in the manufacturing, buying and selling. Excellent opportunity with large concern located in midwest. Address: Box 267, The FOUNDRY, Cleveland 13, Ohio.

FOUNDRY FOREMAN

By old established agricultural implement concern in Eastern territory. Experienced in bench, floor, machine molding. Good opportunity for man who can control scrap and costs. Address: Box 269, The FOUNDRY, Cleveland 13, Ohio.

FOUNDRY SUPERINTENDENT

For grey iron foundry employing 225 men—capacity 60 tons a day, medium heavy castings. Specialize in dry sand molding. Northwestern Pennsylvania. Give complete details of experience and salary expected. Address: Box 257, The FOUNDRY, Cleveland 13, Ohio.

PATTERN MAKER

Steel, for cast iron fixture plant. Must be first class, good wages, steady, located in Eastern Ohio. Give full particulars. Address: Box 245, The FOUNDRY, Cleveland 13, Ohio.

FOUNDRY SUPERINTENDENT

Thoroughly experienced in all operations of gray iron and semi steel jobbing foundry. Wide variety of work. Location Eastern Seaboard. Fine opportunity for right man. Write in confidence, stating age, experience and salary requirements. Address: Box 254, The FOUNDRY, Cleveland 13, Ohio.

SUPERVISOR

Molding line production automotive foundry. Small community Middle West. Address: Box 228, The FOUNDRY, Cleveland 13, Ohio.

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Capable of taking charge of a small brass foundry in the western Pennsylvania area. State qualifications, experience and salary expected in application. Address: Box 291, The FOUNDRY, Cleveland 13, Ohio.

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Young research chemist for foundry supply field—salary—permanent position. Address: Box 265, The FOUNDRY, Cleveland 13, Ohio.

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Well established gray iron foundry specializing in match plate and cope and drag work desires a commission representative in each of the following areas: 1. New England states 2. New York State 3. Ohio, Indiana, Kentucky 4. Detroit, Michigan 5. Georgia, South Carolina, Alabama. Address: Box 197, The FOUNDRY, Cleveland 13, Ohio.

Manufacturer's Agents

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Factory representative capable of assisting district representatives by nationally known manufacturer of dust control and ventilating equipment. Address: Box 280, The FOUNDRY Cleveland 13, Ohio.

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Interested in securing additional representation in Western Pennsylvania, Southern Ohio, Kentucky, Virginia, Texas and Louisiana. Please write: Box 270, The FOUNDRY, Cleveland 13, Ohio.

Positions Wanted

GREY IRON SUPERINTENDENT OR MANAGER

Wants position with progressive foundry. Excellent practical and technical education, middle age, good health, pleasing personality and results guaranteed. References. Address: Box 296, The FOUNDRY, Cleveland 13, Ohio.

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TWENTY-FIVE YEARS' EXPERIENCE AIRCRAFT PARTS OR ANY INTRICATE WORK. FULL OR PART TIME. OHIO AREA OR METROPOLITAN NEW YORK LOCATION PREFERRED. ADDRESS: HAROLD C. HAASE, 557 SOUTH FOREST DRIVE, WEST ENGLEWOOD, NEW JERSEY.

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MAN WITH A PROVEN RECORD OF ACHIEVEMENT AS OPERATING HEAD OF ONE OF THE LARGEST FOUNDRIES IN THE EAST. GRADUATE ENGINEER. 36 YEARS OF AGE. EXCELLENT REFERENCES. ADDRESS: BOX 275, THE FOUNDRY, CLEVELAND 13, OHIO.

PLANT MANAGER

Twenty-two years' experience in gray iron. Have excellent qualifications. Several years' experience as a plant manager. Understand administrative end as well as practical end of business. Address: Box 276, The FOUNDRY, Cleveland 13, Ohio.

PERMANENT MOLD FOUNDRYMAN

Graduate engineer of proven ability in design and operation of permanent molds for aluminum. Fully practical, handle all phases from estimating to finished casting. Address: Box 286, The FOUNDRY, Cleveland 13, Ohio.

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And supervisor desires position with electric steel foundry making small and medium size castings. Thoroughly experienced in cost, budget system and man hours control. Address: Box 277, The FOUNDRY, Cleveland 13, Ohio.

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Ten years' experience, specializing in melting and sand control in malleable, gray iron, semi-steel, brass and aluminum. McLain graduate and graduate of foundrymen's course, I.C.S. 6 years' experience as foreman and superintendent. Now employed, age 37. Address: Box 299, The FOUNDRY, Cleveland 13, Ohio.

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37 years of age—18 years' experience in jobbing and production foundries making pressure, cored and machine tool castings ranging from 2 lbs. to 20 tons. Industrial engineer by education, foundryman by experience. Wide experience in labor relations including contract negotiations. Held positions from melting foreman to the last 4 years as general manager. Excellent references. Address: Box 262, The FOUNDRY, Cleveland 13, Ohio.

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Twenty-five years' practical experience—15 years as molder and 10 years as foreman and superintendent of both jobbing and high productive shops. Well versed in all departments including cupola, mixing metal, rigging and gating for fast production and best quality castings. Cost minded and can handle men. Address: Box 297, The FOUNDRY, Cleveland 13, Ohio.

Classified Advertising

Positions Wanted

MANAGER-SUPERINTENDENT

Engineering graduate with 20 years of operating experience desires permanent position. Capable of handling all details from estimate to finished grey iron castings. Familiar with core blowing, all kinds of high production and jobbing molding equipment, cupola operation and modern cleaning equipment. Can find the cause and correct losses. Successful in handling organization and labor relations. Address: Box 249, The FOUNDRY, Cleveland 13, Ohio.

FOUNDRY SUPERINTENDENT OR SUPERVISOR

Experienced foundryman, age 37 desires position with a good jobbing or production foundry. Know all phases of foundry operations to produce quality work in gray iron, semi steel or steel. Address: Box 258, The FOUNDRY, Cleveland 13, Ohio.

PATTERN FOREMAN

Capable in wood and metal pattern shop. Can take complete charge, estimate layout work, supervise men and train apprentice. Working foreman in small shop. Know foundry gates and can act as trouble shooter. Address: Box 259, The FOUNDRY.

FOREMAN

Desires position as foreman or superintendent. Practical man. Twenty-two years' experience from molder to foreman gray iron or nonferrous, soil pipe and fittings. Prefer Western or Central New York. Address: Box 201, The FOUNDRY, Cleveland 13, Ohio.

CASTING SALES ENGINEER

Eighteen years' top experience in aluminum permanent mold and sand with some of the largest producers. Management, sales, engineering and estimating—all phases of foundry operations. Interested in ferrous or nonferrous sales. Age 39. Address: Box 295, The FOUNDRY, Cleveland 13, Ohio.

METALLURGIST

Metallurgical engineer with 12 years' experience in wide variety of metallurgical problems—research, development, control and trouble shooting in malleable, gray iron and steel foundries. Desires responsible position with progressive firm. Address: Box 288, The FOUNDRY, Cleveland 13, Ohio.

MANAGEMENT-SALES

Consulting engineer in the permanent mold field is seeking a responsible position in the Portland, Oregon or San Francisco areas. Product exploitation preferred. Address: Box 302, The FOUNDRY, Cleveland 13, Ohio.

FOUNDRY SALES

Foundry superintendent desires position with manufacturers of machinery, foundry equipment or material as a sales or service representative. Many years in steel, iron melting and production. Best references, any territory. Address: Box 293, The FOUNDRY, Cleveland 13, Ohio.

FOUNDRY EXECUTIVE

Desires connection with progressive foundry. Age 42, married, 23 years' practical experience in iron, steel and manganese. Eleven years' in foundry supervision and management. Have training in Lincoln Extension Institute. At present time employed with Mid-West company. Address: Box 290, The FOUNDRY, Cleveland 13, Ohio.

FOUNDRYMAN

Desires position in progressive steel foundry. Age 38 years; married; high school graduate; I.C.S. course in foundry practice; trade school in general machine shop and drafting. Eighteen years' general foundry experience. Six years' foreman. Experienced in floor and bench work; all types machine molding a specialty. Some cleaning and core room practice. Address: Box 285, The FOUNDRY, Cleveland 13, Ohio.

GRAY IRON FOUNDRYMAN

Practical foundryman with technical training. Thirty-two years' experience, including fifteen years of supervision. Well versed in all phases of jobbing and production work on light and medium castings. Progressive and up-to-date in modern methods. Capable of taking complete charge of medium size foundry. Available on short notice. Address: Box 285, The FOUNDRY, Cleveland 13, Ohio.

Consultant

FOUNDRY CONSULTANT

On all phases of gray iron foundry operation you will do well to consult with a man who has had years of successful experience in pressure castings, diesel, gas and steam engines and machine tools. Address: D. M. WHYTE, MARTINSBURG ROAD, MT. VERNON, OHIO.

Open Capacity

OPEN CAPACITY

Nonferrous foundry and machine shop located in Southern Michigan has open facilities for castings and machining.

BOX 282

The FOUNDRY **Cleveland 13, Ohio**

OPEN CAPACITY

Small foundry in Richmond, Va. has open capacity for light castings in aluminum or iron. Aluminum production work preferred. Address: T & L Enterprise Foundry, 2301 Royal Ave., Richmond, Va.

AVAILABLE CAPACITY

Our foundry has open capacity to supply small and medium size gray iron castings. Send sample. Address: OREGON CASTINGS CO., RD 3, Lititz, Pa.

Opportunities

90 PER CENT OF THE CUPOLAS MELT UP TO ONLY 50 TO 60 PER CENT

capacity per hour—although the best and hottest iron is produced only when cupola is operated to its capacity. Report on your cupola may prove an eye-opener—usually the savings are surprising. Every pound of steel used in cupola mixtures reduces cost and increases strength 20 to 60%, because steel is purer than the most expensive pig iron. Watch the scrap pile—statistics prove casting losses can be held between 1 to 5% depending on the line of work. Our system is not an expense—but a valuable investment. Synopsis free.

McLAIN'S SYSTEM INC.
236 E. NORTH AVE.
MILWAUKEE, 12, WIS.

OPPORTUNITY

1948 issue Penton's list of foundries in United States & Canada practically new, showing what they make, capacity, etc. Cost $50.00. Sell for $30.00. Address: Box 298, The FOUNDRY, Cleveland 13, Ohio.

OPPORTUNITY

We can furnish at any point slack, fibre and tight barrels; also fibre and steel drums. Address: BUCKEYE COOPERAGE COMPANY, 3807 ORANGE AVENUE, CLEVELAND 15, OHIO.

Foundries for Sale

NONFERROUS FOUNDRY

Three miles from Chicago's loop, 4300 square feet of floor space. 2 jolt squeezers, etc. $1400 full price. $60 per month rent. Address: Box 211, The FOUNDRY, Cleveland 13, Ohio.

Foundries For Sale

GRAY IRON FOUNDRY

FOR SALE

Squeezers and conveyor. Modern core room and ovens. Railroad siding. Capacity 40 tons per day. Plenty of orders and good pig iron source. Located in the industrial section of Lower Michigan.

BOX 272

The FOUNDRY, CLEVELAND 13, OHIO

FOUNDRIES FOR SALE

GRAY IRON FOUNDRY—Very profitable medium size foundry. Well established business. Priced low as owner is retiring.

GRAY IRON FOUNDRY—Produces castings up to 5 tons. Good building and equipment. Price $90,000.

EDWARD H. ZOLL
Industrial Properties Throughout the East
790 Broad St. **Newark 2, N. J.**

Employment Service

SALARIED POSITIONS

$3,500—$35,000

If you are considering a new connection communicate with the undersigned. We offer the original personal employment service (38 years recognized standing and reputation). The procedure, of highest ethical standards, is individualized to your personal requirements and develops overtures without initiative on your part. Your identity covered and present position protected. Send only name and address for details.

R. W. BIXBY, INC.
101 DUN BLDG. **BUFFALO 2, N. Y.**

SALARIED PERSONNEL

$3,000—$25,000. This reliable service, established 1927, conducts confidential negotiations for high-grade men who seek a change of connection under conditions assuring, if employed, full protection to present position. Send name and address only for details. Personal consultation invited. Address: JIRA THAYER JENNINGS, 241 ORANGE STREET, NEW HAVEN 10, CONN.

Wanted-To-Buy

WANTED

Electric furnace—Detroit type LFY—complete with transformer and automatic controls. Must be recent design and in good condition. Write full particulars including serial number, transformer characteristics and best cash price to: Box 250, The FOUNDRY, Cleveland 13, Ohio.

Classified Advertising

Wanted-To-Buy

WANTED

DeWalt ME-2 foundry machine, used for the removal of gate, risers, etc.—large table and swinging arm, manufactured by DeWalt, Inc. of Lancaster, Pa. Address: Box 263, The FOUNDRY, Cleveland 13, Ohio.

WANTED

1—Medium sized American sand cutter; 1—Muller—4 to 8 cu. ft; and 5 trolley ladles—approximately 500 lb. capacity. Address: PIONEER FOUNDRY & MFG. Co., GILBERTVILLE, MASS.

GRAY IRON FOUNDRY

Manufacturer wishes to purchase gray iron foundry with a capacity of 15 to 30 tons per day. Must be located West of Chicago. Address: Box 266, The FOUNDRY, Cleveland 13, Ohio.

WANTED

5-10 ton electric furnace. Address: NYLEN PRODUCTS COMPANY, ST. JOSEPH, MICHIGAN.

WANTED

24" Shaper. Address: SANITARY CO. OF AMERICA, LINFIELD, PA.

WANTED

Pattern equipment for A, AB and C line V-belt sheaves and other power transmission equipment. Address: Box 273, The FOUNDRY, Cleveland 13, Ohio.

MIXERS WANTED

Used Simpson Intensive Sand Mixers. State size, condition and lowest cash price for immediate acceptance. Address Box 578, The FOUNDRY, Cleveland 13, Ohio.

WANTED

Railroad track scale, used, in good condition, 100 ton beam capacity, 56 or 60 feet.

BOX 294

THE FOUNDRY CLEVELAND 13, OHIO

FOR SALE

65—800 lb drums of

DELTA GRAKOAT

3—500 lb. drums of

DELTA CHILLKOAT

This material is in good condition and can be inspected at any time at our plant. We are willing to accept any reasonable offer for this material f.o.b. our plant.

Direct inquiries to W. F. Pfeiffer, Purchasing Agent.

MACK MANUFACTURING CORP.
NEW BRUNSWICK, N. J.

FOR SALE

No. 3½ Whiting cupola, with Roots Connersville 12 x 30 rotary blower, G.E. 20 H.P. motor. Both in excellent condition.

CHICAGO FOUNDRY COMPANY
2028 N. MAJOR AVE. CHICAGO 39, ILL.

FOR SALE

9-Unused Marschke heavy duty SWING FRAME GRINDERS for foundry operations or steel mill billet and plate grinding. Code SSLZH, wheel size 24" x 3" x 12", three speed 9200 SFPM, with 20 HP, 440/3/60 motors. Weight 1600 lbs. each.

FRANK B. FOSTER, INC.
2217 OLIVER BUILDING
PITTSBURGH 22, PA.
CABLE ADDRESS: "FOSTER PITTSBURGH"

For Sale

FOR SALE

1 Ingersoll Rand direct motor driven cupola blower. Pressure 1.25 lbs. Volume 7500 Cu. Ft. per minute. 1 Pittsburgh transformer used on an electric furnace. 1 phase, 60 cycle polarity subtractive type O.D. S. C. Spec. 9246 serial #712289 KVA 667 volts HT 4600 Volts LT 125 475 gallon.

NEW HAVEN FOUNDRY
NEW HAVEN, MICHIGAN

FOR SALE

1—Whiting counterbanlanced tumbling mill, 42" dia. 72" long with clutch and brake. In good operating condition.

THE CAROLINE FOUNDRY COMPANY
723 S. Caroline St. Baltimore 31, Md.

SCHUTTE & KOERTING TUMBLING & WASHING BARREL

Tilting type, 1 gear head motor to rotate barrel, 1 gear head motor to raise and lower barrel, inside dimensions of barrel 24" deep x 28" wide, 1⅜" bronze. Motor characteristics 220/440/60/3. Excellent condition. At a fraction of original cost. $375 f.o.b. Mansfield, Pa.

BILLARD MACHINE & TOOL CO.
PHONE 44 MANSFIELD, PA.

FOR SALE

One Herman rollover molding machine like new, 40" x 58" size 18" cylinder independent turnover and drawing machine 45" arms. Equipped with air clamps 40" flask distance combination pattern and flask space 40". 3740 pounds rollover capacity. Address: W. S. BREMER CO., NEW WASHINGTON, OHIO.

FOR SALE

New heavy duty motorized rod cutter, 65 cuts per minute; capacity: ⅝ inch round hot rolled steel. Brand new. $890.00 f.o.b. Cleveland. Address: The Federal Foundry Supply Co., 4600 East 71st St., Cleveland 5, Ohio.

FOR SALE

1—1000 ton PHM hydro power fast traverse casting straightening press complete with 3 conductor HPM type CFMA 12"40 HP operating system, including die carrier and 40 HP, 900 RPM, 440 volt, 3 phase, 60 cycle, TEFC motor and reduced voltage starter. Address: CENTRAL FOUNDRY DIVISION, GENERAL MOTORS CORP., DANVILLE, ILL.

MOLDING MACHINE FOR SALE

Herman heavy duty 40"x50" jarring machine—13" cylinder. Address: J. F. QUEST FOUNDRY CO., 900 SOUTH 4th St., MINNEAPOLIS 15, MINN.

FOR SALE

50 H.P. totally enclosed ball bearing electric motor, 1750 RPM, 550 centigrade continuous, 440 volt, 62 amperage, 3 phase. Immediate shipment. Never used. Write or phone: ATTWOOD BRASS WORKS, GRAND RAPIDS, MICHIGAN.

FOR SALE

Patent No. 2,052,465 and wood and metal pattern equipment for producing water meter box covers. $1,500.00. Address: FRED E. HARDY, JR., 306 E. MAIN ST., SHELBYVILLE, ILLINOIS, PHONE 570.

FOR SALE

GOOD USED EQUIPMENT

Sly dust collecting system, consisting of 3 Sly 62" dust filters to handle 15,000 CFM each: motors 220/440 V. 3 ph. 60 cycle. Was erected but not used.

6 ton Northern 46' span, 2 motor 230 volt DC bridge crane. Rope floor controlled. 20-ton P&H 35' span, 3 motor, cage controlled, 230 volts DC.

50 KW, GE motor generator set.

IRA C. JORDAN
2508 E. Belleview Place Milwaukee 11, Wis.

For Sale

1 #2 American Gas Furnace, Elizabeth, N. J., Annealing.
2 Gehnrich Core Ovens, Height 96", Depth 88", Width 69"
73 Sterling Steel Flasks, 10 x 20 x 5½ x 5½
6 #1 Johnson & Jennings Moulding Machines
Serial #1159-2870 Serial #1159-2866
Serial #1159-2862 Serial #1159-2861
Serial #1159-2860 Serial #1159-2863
1 #2 Johnson & Jennings Moulding Machine, Serial #1003-3171 never used
1 53" Gardner Surface Grinder, motor driven
1 Electric Oven, Federal Mfg. Co., 4 drawers, max hgt of core 2"
1 Porter Cable Wet or Dry Vertical Belt Grinder, Syracuse, N. Y. Type BG-8, Serial No. 7146
1 Beardsley & Piper Screenarator No. BP-11812
1 Link Belt Speed Reducer, Size T-10LH, Order H-27881-F10 Input RMP 1380, Output 10.1, Ration 136.4, Service Factor 1. 16.5 Input H.P.
2 Spencer Turbo Compressor—420 C.F.M., .55 oz., 15 H.P., 3 PH 60 cycle, V. 220, RPM 3500
1 Besley Grinder #214, Serial #214-30061, Model 5KF, 405 FPI, Type KF, Volts 220/440, 3 PH, Cycle 60, Speed F.L. 1170, 25 HP
5 Adams Slip Flasks, 18 x 18 x 4 x 5
3 Hines Flasks, 10 x 20 x 4 x 4
7 Tabor 10" Squeeze Cylinder Machines, squeeze & jolt squeeze
2 Tabor 12" Squeeze Cylinder Machines, squeeze & jolt squeeze
1 Pangborn Airless Rotoblast Table, Steel Shot Cleaning Machine 6', ½ Type LG, 9" Serial #6LG9-43, with motors as follows: Elevator 1½ H.P., 1200 RPM, Rotoblast Wheel 15 H.P., 1800 RPM, Separator ¼ H.P., Table 1½ H.P., 1200 RPM, Spider with 12 auxiliary tables with vari-speed. Pulley 6 to 3 to 1 ratio. 1 Rev in 3 minutes to 1 Rev in 1 minute.
1 Hanging Electric Riddle—Emerson Elec. Mfg. Co. 36" diameter ½ H.P., #H36TS26, 83830 E.J., 208 Voltage, 60 cycle.
1 Brownie Lift Truck, 108" Lift, Model FHLT 3000, No. F 1132 Berry Motor Car Company.
1 Fordson Tractor
1 Beardsley & Piper Sandslinger, Stationary Type, Swivel Arm

NATIONAL FOUNDRY COMPANY OF NEW YORK, INC.
10 SANDFORD ST. BROOKLYN 5, N. Y.

LIST OF EQUIPMENT FOR SALE

5—#2 Simpson Mixers with and without loader, all have motors.
16—J-275 Osborn Jolt Squeezers.
1—Model "AA" Sand Cutter.
1—Blystone, motor driven and clutch.
1—Schramm Air Compressor, direct drive, 20 H. motor.
1—#91 Osborn Core Blower.
4—JDP Jolt Strippers.
5—"G" International 20 x 8 Rollover Machines.
1—International "G" Type 24 x 10 Jolt Rollover Machine.
4—Beardsley & Piper Screenarators.
1—Jeffrey Screenarator.
1—"Jr." Royer.
1—"B" Royer.
1—Swing Grinder, 5 H. Motor.
And many other articles too numerous to mention.
1—Plain Jolt Machine 40 x 60 Table.

HAYNES FOUNDRY EQUIPMENT CO.
814 ADA ST. KALAMAZOO 52, MICH.

FOR SALE

100 sets, round flasks, 23" dia. 5" cope, 5" drag, steel. Price $15.00 set. Address: Box 289, The FOUNDRY, Cleveland 13, Ohio.

SURPLUS SAND BLASTING EQUIPMENT FOR SALE

Pangborn cabinet EN2 5' x 36" x 7'1" with dust collector electric motor and blower—Price $375.
Ruemelin cabinet 5' x 36" x 6½" with turntable dust collector blower and motor—Price $350.
Sly cabinet 4" x 36" x 5½" with dust collector, electric motor and blower—Price $300.
Pangborn tumbling barrel 24" x 15"—Price $300.
6' rotary turn table Pangborn with 4 nozzles used for shot peening direct pressure Pangborn automatic sand blasting generator, elevators, abrasive separators.

M. ELSTEIN
141 MANGIN ST. NEW YORK 2, N. Y.

Classified Advertising

For Sale

EQUIPMENT FOR SALE

MOLDING MACHINES
3—75J Osborn Jolt Squeeze
2—SPO #611-B Stationary, Oscillating, Jolt, Squeeze Strippers
1—SPO #4½ JHS Air Jolt Hand Strip
1—Tabor Plain Squeeze, Strain Rod Type
3—Mumford 3" Cyl. Core Jolt, with 20" x 15" Table
BLOWERS FOR CUPOLAS AND FURNACES
6—#865 General Blowers, 5 HP, 3/60/220, 1400 CFM at 8-oz. pressure
Maxon-Premix Blowers for Gas, ½ to 1 H.P.
METAL MELTING EQUIPMENT
1—Recirculating Gas Fired Oven with all controls, suitable for Core Oven
2—Hausfeld 1000# Aluminum Capacity Furnaces, Barrel Type, Open Flame, Oil Fired
2—Hausfeld 2000# Aluminum Capacity Furnaces, Barrel Type, Open Flame, Oil Fired
3—Stationary Gas Fired #60 Crucible Furnaces, with ¼ H.P. Maxon-Premix Blowers
2—Monarch-Rockwell Rotating, 500# Brass, Oil New 32" to 41" Dia. Shell Cupolas made to order.
TUMBLING MILLS AND SAND BLAST
1—Pangborn #2 Barrel, Suction Feed, Motor Drive, Complete
1—American Foundry Equipment Co. No. 1 Multi-table Wheelabrator with 12-8" dia. work tables. Complete unit.
2—Pangborn No. 2 GH direct pressure type sandblast barrels, motor driven. Complete units.
1—Pangborn LE 6 ft. sandblast table, continuous sand feed, motor driven. Complete unit.
1—Pangborn LE 4 ft. sandblast table, continuous sand feed, motor driven. Complete unit.
1—Pangborn Sand Blast Unit including generating tank, shot cleaner, bucket elevator and dust collector with motor. Suitable for use with room.

1—Mono-Rail System Complete with approximately 1200 ft. of track, 74—250# capacity 110 Volt hoists, two and four wheel trolleys, switches, 35—2000# 20 ft. bridges, and all necessary parts to install.

MISCELANEOUS
4—Heavy duty flexible shaft grinders 2 HP
30—Jib Cranes, Floor Type, 1000 to 2000 lbs. capacity, 180° swing, 10 to 15 ft. arms
30—1000 lbs. Capacity Budget Electric Hoists
5—Low Lift Electric Trucks, 2000 lbs. capacity and up. Riding Operator Style
1—Heavy Duty Back Geared Sprue Cutter, 1½" square knives, T & L Pulley Drive
1—5 x 10' Simplicity Shakeout, complete with motor.
Miscellaneous Electrical and Gravity Conveyor Systems

CLIFTON MACHINERY CO.
1023 W. 6th ST. CINCINNATI 3, OHIO
PHONE PARKWAY 7812

FOR SALE

Complete bronze foundry equipment including 2 band saws, 4 molding machines, air compressor, tumblast barrel, flasks, crucibles, tongs, shanks and 3 grinders. This equipment was producing $12,000 to $14,000 castings monthly. Price $2500. Address: Box 271, The FOUNDRY, Cleveland 13, Ohio.

STEEL TUBING—FOR SALE
Immediate Delivery

5.058" OD x 1.060" Wall 16' R/L 90 tons

4.895" OD x 1.073" Wall 35 ⅝" Lgths. 94 tons

Specifications SAE 4340, Hot Rolled

GLAZER STEEL CORPORATION
Knoxville, Tennessee Phone 4-8601

FOR SALE

One Modern Equipment Company quick detachable teapot spout ladle—9900 lb. steel capacity, worm and worm-wheel gearing, square bail. In nearly new condition. This ladle surplus with us and has been used for only two heats. Address: American Hoist & Derrick Co., 63 SOUTH ROBERT STREET, ST. PAUL 1, MINN.

For Sale

FOR SALE

1—International Draw Down Stripper, YPD, 30" x 72", Serial #43598.
4—Rollover & Jolting Machines (Osborn) air. Model 2047-1. Flask Space 22½ x 21½, 10" draw—.
1—Jeffrey Sanditioner, Serial #4764—0, 133523, with Allis Chalmers 2 HP Motor, 220/440/3/60/ motor
1—Lot of #150 Dixon Crucibles with 4" lip—$15.00 each
All types of Bucket, Belt, Apron, Chain and Booster Conveyor in stock.
Plus, Roller Conveyor in 10"-12"-14"-16"-18" and 24" wide in standard 8' and 10' lengths. With and Without Stands. Rollers above or below frame as desired.
2—Large Round Mills, 68" long, 32" in diameter
1—Demmler Core Blower, #1, Serial #888, Like New
1—O'Whiting Cupolette, 29" stack, lined to 18" with Blower & Motor
6—Globe Side Tilting Tumbling Barrels.

UNIVERSAL MACHINERY & EQUIPMENT CO.
320 EAST BROAD ST.
SHILLINGTON, READING, PA.

FOR SALE

1—Ingersoll Rand centrifugal cupola blower, 4600 CFM @ 16 oz. Complete with 30 h.p. GE motor; GE automatic air weight control panel; motor operated blast gate; subject to inspection at Northeastern Ohio foundry.

BOX 274
The FOUNDRY Cleveland 13, Ohio

FOR SALE

1—Kellogg model A-250-B industrial water cooled compressor and motor $400.00
1—Gardner-Denver AAD 5—¾ x 5 duplex water cooled compressor with motor and base $550.00
Both in excellent condition.

STROM BRASS FOUNDRY
2646 SOUTH MAIN ST. ELKHART, INDIANA

FOUNDRY EQUIPMENT

2—Simpson Mixers, size No. 2, late type, enclosed gearing with motor. (One with loader).
1—American Sand Cutter, Type K, with Continental Engine Drive—72" between wheels, 60" cutting cylinder.
2—Model "S" B. & P. Screenerators.
1—Gardner-Denver Air Compressor, 130 cu. ft. actual—V belt drive with motor.
1—45" Cutler-Hammer Magnet—like new.

RAY P. SCULLY
SCULLY MACHINERY & EQUIPMENT CO. NOT INC.
767 MILWAUKEE AVE. CHICAGO 22, ILL.
PHONE: CANAL 6-0314

FOR SALE

Cupola, 66" with 40 ft. stack. No controls or blower. Price $1,200; if loaded on car $1,400. Address: NATIONAL PLUMBING & FIXTURE CORP., ELLWOOD CITY, PA.

FOR SALE

1—Johnson & Jennings bumper machine 18" cylinder, 60"x90" table, 9000 lb. capacity. Address: 278, The FOUNDRY, Cleveland 13, Ohio.

SAND BLAST MACHINES

We have in stock three brand new complete portable sand blasting machines 100 pound, 350 pound and 650 pound capacity in sand. Can be used with steel grit also. New "Sanstorm" type non-clogging design. Ideal for auto body shops, foundries, heat treaters, painters and forge shops. We also have in stock for immediate shipment a #22 Moline portable molding machine (brand new) also a used belt drive tilting tumbling barrel.

FEDERAL FOUNDRY SUPPLY COMPANY
4600 EAST 71st ST. CLEVELAND 5, OHIO

FOR SALE

4 double end custom built polishing stands, can be used also with grinding wheels or wire brushes. 220 v. 3 ph. 2 HP motors. Good condition ready to run. $125.00 each. ADDRESS: INDUSTRIAL ALUMINUM FOUNDRY, 660 ST. CLAIR AVE., COLUMBUS, OHIO.

For Sale

FOR SALE

WHEELABRATOR, AMERICAN, No. 1 Multitable, 45" Dia., complete with Dust Collector—used, good condition—$1750.00.
WHEELABRATOR, AMERICAN, Cabinet type, Serial A-33210, used, good condition—$1250.00.
2—CRESCENT LO-LIFT ELECTRIC TRUCKS platform 24" x 42", 2500 lb. cap., with Battery—used, good condition—Each $500.00.
1—ELWELL PARKER ELECTRIC TRUCK lo-lift—platform 24" x 52" 4000 lb. cap. with Battery—used—$700.00.
BUDGIT ELECTRIC HOISTS, 250 lb., 15' lift, 1 ph., 110 volt, 60 cyc. Excellent Condition. EACH $65.00.
1000 lb. BUDGIT ELECTRIC HOISTS 220 volts, 3 ph., 60 cy.—used. EACH $95.00.
1000 lb. BUDGIT ELECTRIC HOISTS 440 volts, 3 ph., 60 cyc. used. EACH $90.00.
3—TON YALE, MODEL 20B, ELECTRIC HOIST with Trolley attached. D.C. 220 volt, used—EACH $300.00.
1—TON SHEPARD ELECTRIC HOIST D.C. with powered Trolley, 230 volt, used—$250.00
AMERICAN MONORAIL NO. 417. Girder Rail—excellent condition—per ft. $2.25.
AMERICAN MONORAIL BRIDGES, 1 Ton cap. 20' Span, hand type push—excellent cond. EACH—COMPLETE $75.00.
4 WHEEL PLATFORM TRUCKS Hitch & Hook type 36" x 80"—used. EACH $25.00.
4 WHEEL PLATFORM TRUCKS Tongue type, all steel, Rubber tires, 48" x 120"—19" high, used. EACH $50.00.
JEFFREY PORTABLE CONVEYOR, elec. 220/440 3 ph. 60 cyc. 39" wide x 17' long, adjustable Height to 10 ft., wood slats, used. $400.00.
GRINDER & BUFFER comb., swing frame type powered by 15 hp Westinghouse Motor 3 ph. 60 cyc. 220/440, belt driven wheel speed 9500 SFPM. Mfg.—Marschke, excellent condition. $400.00.
Ilg UNIT HEATERS, steam 217,000 B.T.U., A.C. 110 or 220 v. New. EACH $165.00.
DUSTOP—AIR FILTERS 10 x 20 x 2. New. EACH $ .25. 5¼ x 9¼ x 1⅛ New. EACH $ .10.
Rotating FORGE BLOCKS to hang from Crane, D.C. 220 volt. 25 Ton Cap. New $2000.00. 15 Ton Cap. New $1250.00.
LIFTING MAGNET, 39" DINGS 230 v. D.C. with controls cable, cable reel—used, excellent cond. complete $1200.00.
All Types ROLLER CONVEYOR.
All Items subject to prior sale and FOB Cincinnati, O.

ALLIED SALES
237 MILL ST., CINCINNATI 3, OHIO
CHERRY 2217

FOR SALE

COMPLETELY REBUILT V-12 GREENE FURNACE with top charge roof and electrode crane with 4500 KVA of transformer equipment for 6600 or 13,200 volts, 50 or 60 cycles.

GREENE ELECTRIC FURNACE CO.
2702 6th St. Seattle 4, Wash.

FOR SALE

2—Osborn #602 jolt rollover pattern draw molding machines.
1—Gehnrich continuous core oven.

MARCH BROWNBACK CO., INC.
POTTSTOWN, PA.

FOR SALE

American skip bucket loader in excellent condition. Address: BERRETTINI ELECTRIC CO., 380 N. MAIN ST., PLAINS, PA.

FOR SALE

7—Walker York coke furnaces including:
2 No. 22 which will take up to No. 150 crucibles
3 No. 30 which will take up to No. 180 crucibles
2 No. 28, complete with hard tilting apparatus which will melt up to 600 pound charge.

THE PHOSPHOR BRONZE CORP.
2200 WASHINGTON AVE.
PHILADELPHIA 46, PA.

Classified Advertising

For Sale

FOR SALE

TURBO GRINDERS

(2) 2200 cfm @ 2½ lb. Spencer Turbo Blowers with 40 HP 3 phase 60 cycle 3600 RPM totally enclosed fan cooled motors.

1675 cfm @ 2½ lb. Spencer Turbo Blower 30 HP 3 phase 60 cycle 3600 RPM totally enclosed fan cooled.

1400 cfm @ 16 oz. Spencer with 220/440 volt 3 phase 60 cycle motor.

150 cfm @ 3 lb. Spencer with 5 HP 3600 RPM motor.

PRESSURE BLOWERS

2500 cfm @ 7 oz. Sturtevant with 15 HP 3/60/220/440 volt motor.

2300 cfm Clarage with 2 HP 3/60/220 volt motor.

1400 cfm @ 8 oz. Robinson with 5 HP, 3/60, 3600 RPM motor.

1100 cfm @ 16 oz. Sturtevant.

450 cfm @ 6 lb. A & B with 30 HP motor.

250 cfm @ 12 oz. GE with 2 HP motor.

THE MOTOR REPAIR & MFG. CO.
1522 HAMILTON AVENUE
CLEVELAND 14, OHIO

FOR SALE

1—18" x 25" Roots-Connersville positive pressure blower with 125 H.P. motor.
1—Motor operated Butterfly valve.
4—3 Ton Whiting steel converter shells with 2 tilting assemblies.
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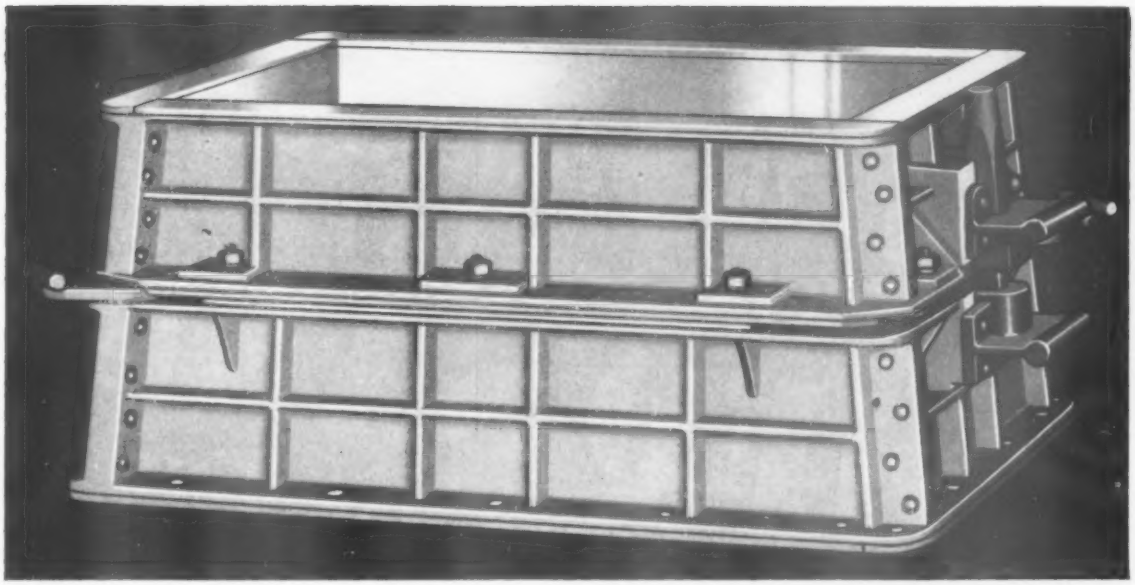

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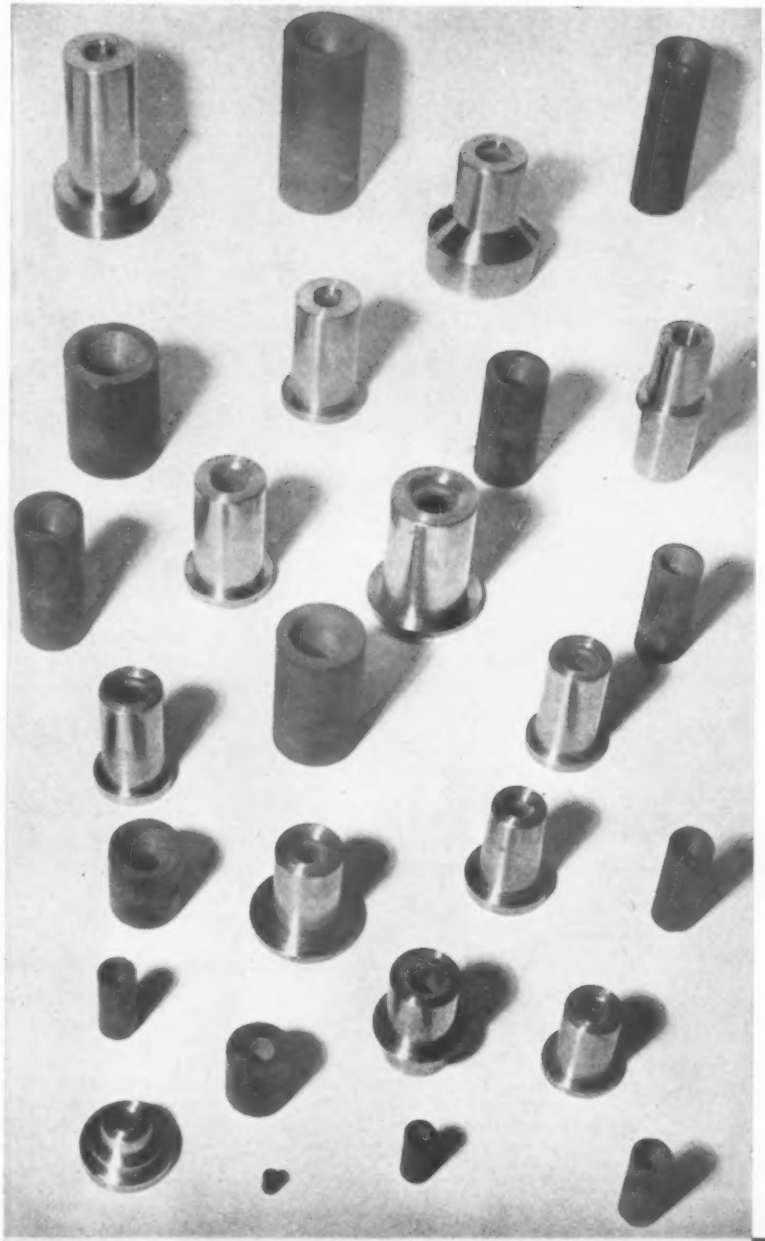

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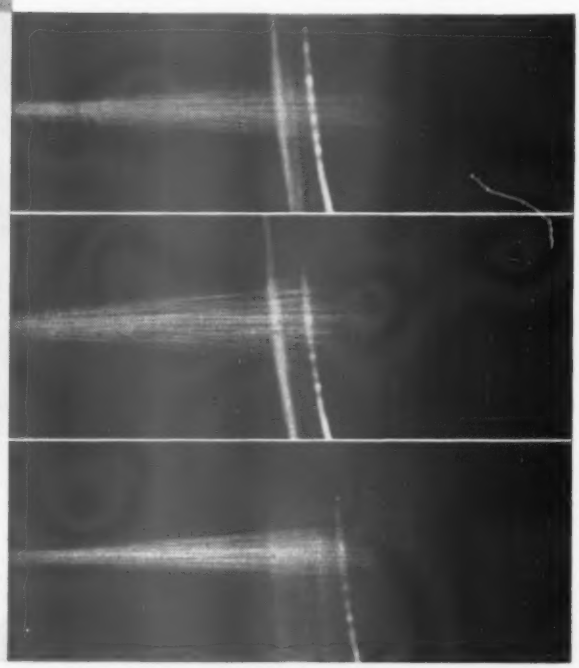
NORBIDE nozzles are made of Norton Boron Carbide—the hardest material made by man.

NORTON COMPANY
Worcester 6, Massachusetts



High-speed photograph of stream from new iron nozzle—note that stream concentration and abrasive velocity and volume are fair

Stream from the same nozzle after three hours with silica sand. Outlet opening worn to twice original size—stream concentration poor, abrasive velocity and volume low

Stream from Norbide Nozzle after 404 hours with sand—outlet diameter worn only 0.032"—hundreds of hours of useful life remain—marked stream concentration—high abrasive velocity and volume

MODERN
EQUIPMENT COMPANY

CUPOLA CHARGERS
. . . are *Custom Built* and *Individually Engineered* to meet the Requirements of YOUR FOUNDRY!

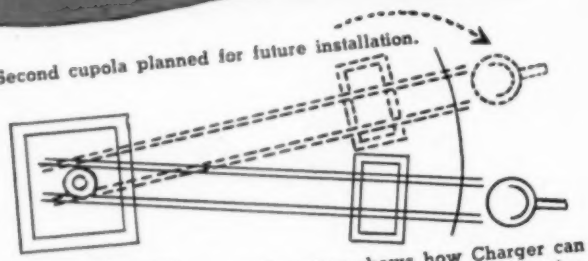
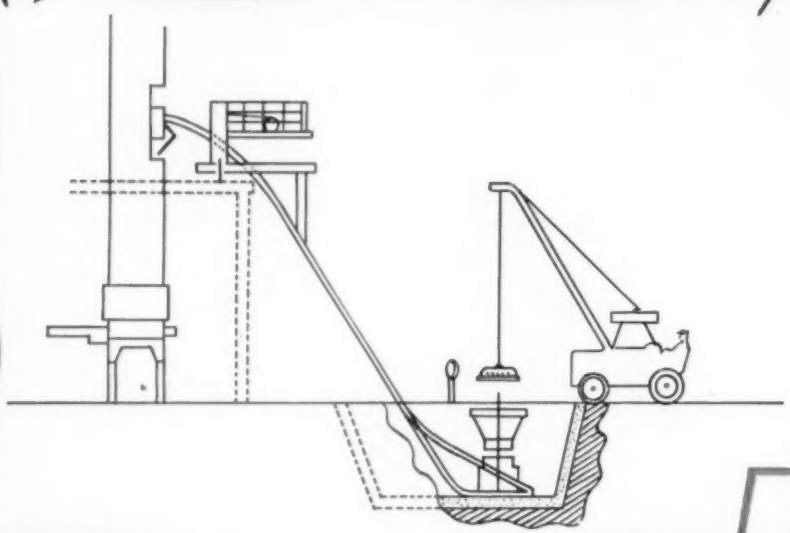


FIG. 1 Top plan view shows how Charger can be moved from one cupola to the other on alternate days. (After second cupola is erected.) Charger frame is mounted on a swivel base located below the weigh hopper, and on a truck which rolls on a curved track segment, in this case at the charging door level. Charger is propelled mechanically. See FIG. 2.



A typical example is the MODERN 2-Cupola Swivel Charger installed at the foundry of Brown Industries, Inc., Sandusky, Ohio . . . pictured on the front cover of this magazine. A second cupola is to be installed later as indicated in Fig. 1.*

The drawings on this page illustrate the basic operating methods and structural principles of MODERN Multiple Cupola Chargers . . . pioneered and developed by Modern Equipment Company.

Ask your MODERN representative for *experienced counsel* and *service* on your *charging* and *material handling* operations . . . or Write for Bulletin 147A.

FIG. 2 Elevation View of MODERN Swivel Charger showing relative position of magnet, weigh hopper, and charging bucket. In making up the charge, the magnet deposits the metal components in the weigh hopper. Coke and stone are added. Upon completion of the charge make-up, in the weigh hopper, it is discharged into the bucket mechanically, as shown in FIG. 3.

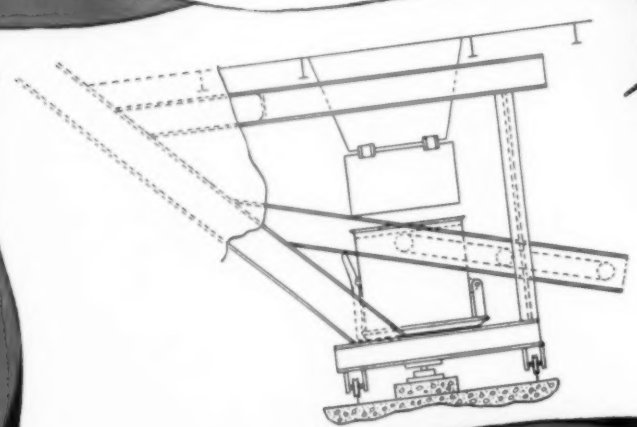


FIG. 3 Shows weigh hopper supported on a scale for accurate weighing of charge components. The complete charge is deposited in the bucket by release of bottom doors of weigh hopper through air or oil control. Bucket is then hoisted to cupola on the I-Beam tracks and discharged as shown in FIG. 4.

FIG. 4 Drop Bottom Bucket discharging into cupola after being hoisted on inclined I-Beam tracks.

MODERN EQUIPMENT CO.
PORT WASHINGTON, WISCONSIN

CUPOLAS • CUPOLA CHARGERS • LADLES OF ALL TYPES • POURING DEVICES • METAL POURING SYSTEMS • CRANE AND MONORAIL SYSTEMS • ELECTRIC CRANES.

...with A Better Core Paste to Speed Production...Cut Costs

PENNIES ARE IMPORTANT TO PRODUCTION—and today, more than ever before, wise foundry operators are seeking ways and means to offset increasing production costs. They realize every possible short-cut to doing a job better and faster can result in substantial profits built of a few cents here, a few cents there . . .

Stevens' No. 4 CORE PASTE is just such a short-cut to savings in core making—not only does it do a better job faster, but does it for less money. Strong words? Yes, and they can be proved, but only one way to your satisfaction—*on the job, in your core room.*

Order a 100 lb. bag or barrel today. You'll find, as have hundreds of others that Stevens' No. 4 Core Paste—

PERMITS FASTER CORE PROCESSING. Within a few minutes after pasting, even going through a fast cycle oven, cores can be safely handled—will not fall apart. Pasted joints will be stronger than core itself.

HAS HIGH "GREEN GRIP" and bonding qualities which reach maximum strength almost immediately.

MIXES EASILY, SMOOTHLY WITH WATER. Applied by hand or putty bulb, a little goes a long way. Clean to work with.

DOES NOT "BOIL OR BUBBLE OUT" between pasted joints when subjected to oven temperatures.

DOES NOT "SOUR OUT" or ferment, even with intermittent use—a condition prevented by germicidal ingredient.

As an all-purpose bond, low in cost and economical to use, you'll find Stevens' No. 4 Core Paste can't be equalled. If you prefer to try before you buy, *send for a production test sample.* We'll let results speak for themselves.

No. 4 is only one of a number of highly qualified Stevens core pastes, among which is a High Temperature Grade, withstanding 3100°F., especially adapted for cores left in mold several hours before pouring.

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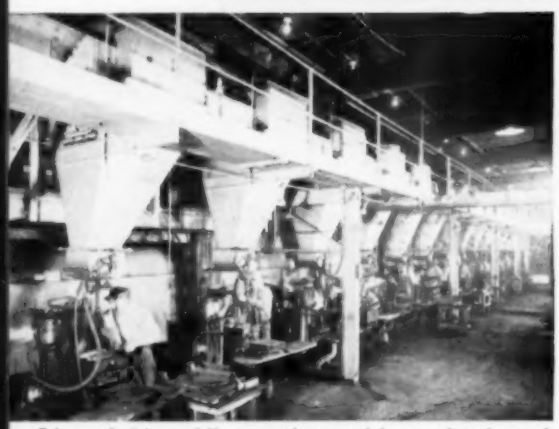
FOUNDRY EQUIPMENT AND SUPPLIES DIVISION

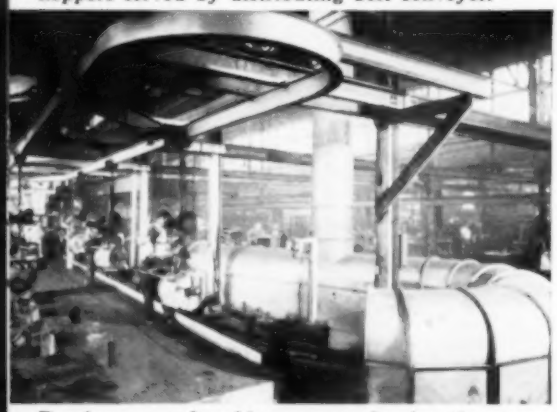
The key to highest efficiency in foundry mechanization •

Link-Belt "PA," Positive-Action Oscillating Conveyor in tunnel under floor of mechanized malleable iron foundry, delivering hot sand and castings to Link-Belt No-Leak overlapping steel apron conveyor for transfer to shakeout screen.

Right: General view of sand handling and preparation unit showing shakeout, elevator and old and new sand storage bins feeding to mixer.



Line of 14 molding stations, with overhead sand hoppers served by distributing belt conveyor.



Pouring zone of mold conveyor, showing three men pouring hot metal into molds which then pass through the ventilated enclosure around to other side of conveyor.

•Link-Belt custom layouts with standardized units

Hardly any two foundry mechanization problems are alike. However, there is one common denominator: the ability and experience of Link-Belt engineers in planning custom layouts to bring about the highest efficiency and lowest costs, using standardized Link-Belt units such as illustrated.

Some typical customer reactions: *more than doubled our production in the same floor space . . . eliminated a bottle neck at the shakeout . . . far less maintenance than with other system* (said of oscillating conveyor) . . . *made the foundry a clean place to work — no smoke* . . . etc., etc.

The list of prominent foundries mechanized by Link-Belt engineering and equipment is imposing.

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THE SYMBOL OF QUALITY — LB — LINK-BELT

LINK-BELT CONVEYORS

AND PREPARATION MACHINERY

MANUFACTURER'S ASSOCIATION, INC. — FOUNDRY EQUIPMENT